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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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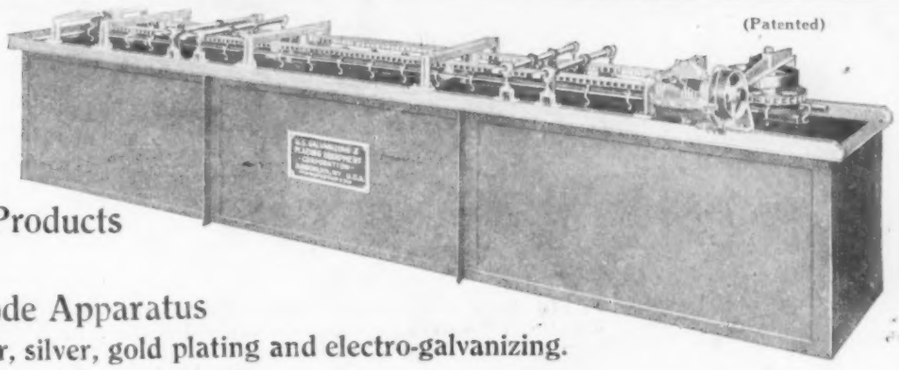

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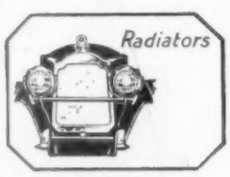

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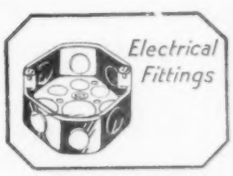

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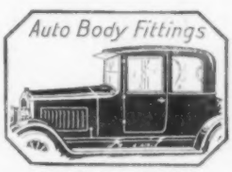

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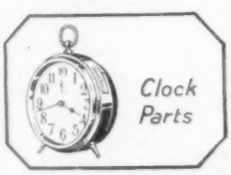

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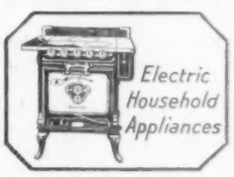

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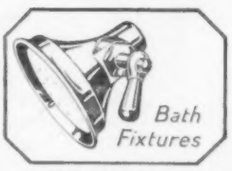

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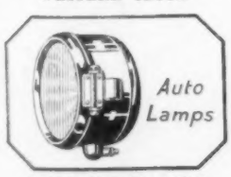

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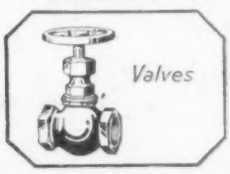

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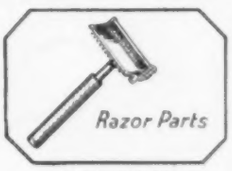

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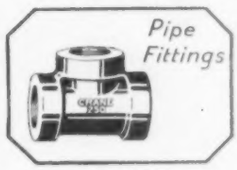

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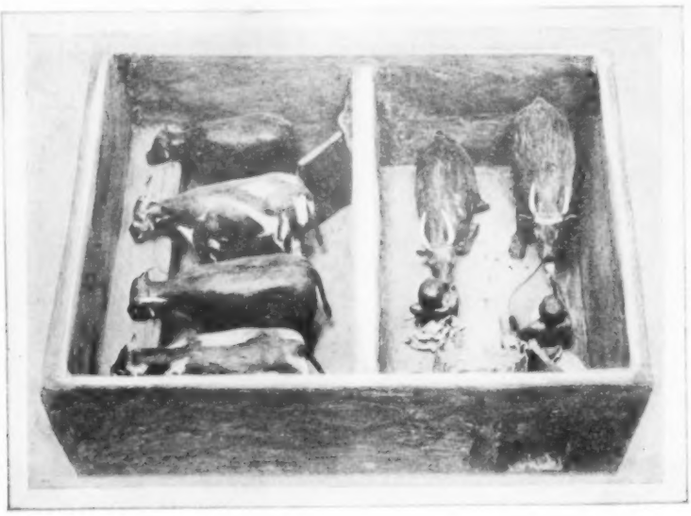
Lacquering — *an art that was never lost*



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In life, King Mentuhotep, ruler of Egypt in the XI dynasty, ordered that his oxen be kept in stalls and fattened by his servants for his table.

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VOL. 21 NEW YORK, NOVEMBER, 1923 No. 11

The Metal Industries of Japan

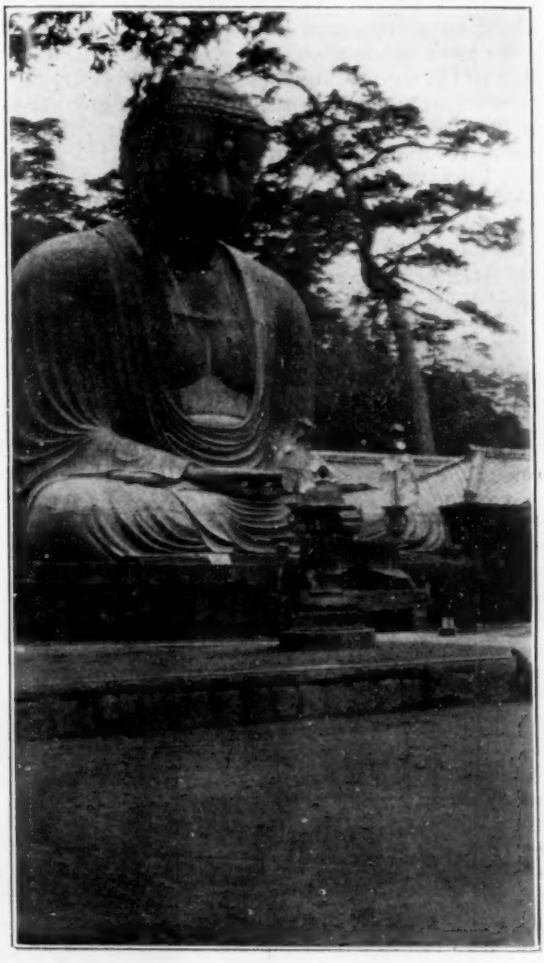
Their Scope and the Effect of the Recent Earthquake on Their Present and Future, As Seen by One Who Has Lived Among Them

Written for The Metal Industry by ERNEST V. PANNELL

Momentous as is the catastrophe which has overtaken the Island Empire of Japan and sad and far reaching as are its consequences it cannot be said that all the estimates which have been made as to its effects on Japanese industry are true. It is true indeed that an appreciable number of important plants and factories were destroyed, some of them, such as the Tokyo Electric Company at Kawasaki, being not only extensive modern buildings but equipped with every up-to-date automatic machine and time-saving device known to us here in America. Nevertheless such statements as "the industries of Japan are crippled" and "recovery of Japan's industrial standing cannot be looked for during the next ten years" are far from the truth and one who knows the infinite patience and soul of the people will expect a rapid recovery and will not be disappointed.

To begin with, Tokyo and Yokohama, although great centers of politics and commerce, were not the chief industrial cities of Japan. In the metal working trades, Osaka, a city as great as Detroit, is supreme, but even so the industry is scattered up and down the islands of Japan without that tendency to extreme centralization which has characterized our own industrial developments. On the other hand the effects of earthquake, fire and flood were strictly localized and although the destruction was terribly complete where it occurred (as in the obliteration of the great naval base at Yokosuka) still there is the great comfort that the territories outside of this region were untouched. So the incredibly vast copper and brass mills and foundries of Furukawa and Sumitomo in Osaka, of Mitsubishi in Kobe, and the mines and factories of Mitsui and Company in Miike are intact as well as the great copper mines of Furukawa at Ashio with a capacity of thirty million pounds per annum and the contiguous refining plant with like capacity.

While the art of metal production flourishes in Japan it must be admitted that there is a wide field for development in the crafts of fabrication. Iron and steel are produced but a great quantity of structural parts are imported. Copper and zinc are produced but the visitor will find sanitary fittings of every kind bearing the name of well known American houses. The preference shown by Japanese for imported articles of metal may come as a surprise to many who have not given the matter study but it is a fact at the present stage of the arts. Two hundred and fifty million dollars are invested in the textile industries, over one hundred million in electrical enterprises, one hundred and forty million in mining, and on the other hand less than seventy million in the metal industry. One of the reasons is unreasonably high pro-



THE GREAT BRONZE BUDDHA AT KAMAKURA, JAPAN, FIFTY FEET HIGH, WEIGHING 400 TONS

duction costs due to old time labor traditions which are only gradually working out. The present, however, is a time of forced reconstruction when the maximum output per unit is so vital a thing that we may look forward to the coming of a new order of things. For the thousands of new and sanitary dwellings which are already beginning to arise equipment must be produced on a scale unknown before this time. In other words a new market has been created which is clamoring for metal products, and production must meet the demand.

It is impossible to touch upon the metal industries of the Japanese Empire without thinking of the master craftsmen of more than a thousand years ago whose work still stands a perpetual monument to their skill and patience. In the temple of the Todaiji Monastery at Nara the ancient capital of Nippon can be seen the greatest bronze statue of Buddha now in existence. The height of the figure is fifty-three feet and its weight nearly one million pounds. In the decoration alone two hundred and ninety pounds of gold are used. The moulding and casting were of course performed in sections the work taking two years from 747 to 749, after which they were brazed together and the exterior surfaces smoothly planished so that the contour is perfect and only in the hollow interior can the joints be seen. Equally perfect is the symmetry of the figure by which one side duplicates the other. Truly there were moulders in those days. From the records still extant which state that seven tons of wax were used, it is presumed that the "cire perdu" process must have been employed for cored patterns although this is generally credited to Benvenuto Cellini who lived eight hundred years later.

The statue of Buddha illustrated, although not as large as that at Nara (it stands only fifty feet from the ground), is better known. Few visitors to Japan have returned without keen memories of Kamakura and the Buddha, splendidly serene, at the head of the long avenue of cedars leading up from the sea. One of the rumors from Japan is to the effect that the Kamakura Buddha was rocked to the ground in the earthquake and destroyed but the writer would incline to the thought that "the Light of Asia" still sits in bronze contemplation while destruction thunders around. For since the casting was reared in the twelfth century it has seen many an earthquake, it has seen Fuji Yama vomiting molten rock and ashes, it has seen its temples burn as feudal lords were vanquished by Yoritomo and it has seen the great Chinese invasion of Kubla Khan, repulsed and shattered. And still it stands a monument to the men who worked in metal a thousand years ago.

Brass Standardization and Exactness*

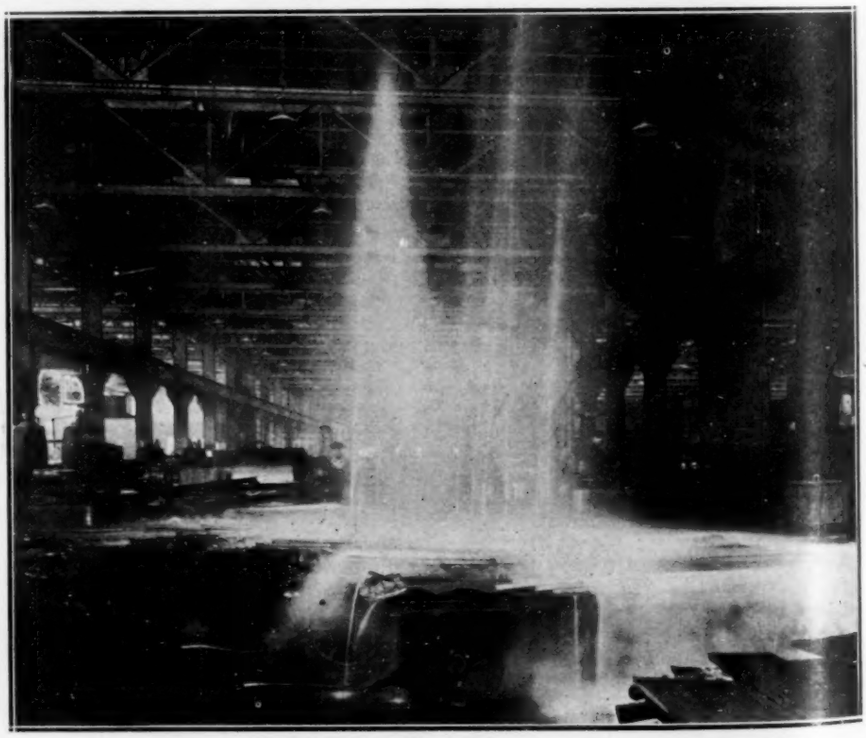
The competition and improvement in modern brass articles have made a stricter observance to detail necessary in the up-to-date brass mill. Brass articles that once were spun from brass with many operations are now stamped out by powerful presses and if the brass sheet is too hard the stamping will be cracked. Too soft a brass will allow easier stamping and drawing, but the surface of the metal will be rough and give an "orange peel" look that makes bad nickel plating.

When only a few thousands of articles of a kind were made from brass sheet, the exact gauges did not matter so much, but now, when brass articles are produced in tremendous quantities, a saving in the thickness of the brass may result in the saving of thousands of dollars, and the modern roller must watch his gauges with care.

As the electrician, the plumber and the machinist must first learn his trade as an apprentice—so must the brass roller start at the bottom and work up to his job. Many boys start out to be rollers but only about two out of every twelve finish their training.

Rollers are of three classes, "breaking down rollers," "running down rollers" and the "finishing rollers." The "breaking down roller" rolls his brass just after it has been cast into sheet form and then turns it over to the "running down roller" who reduces the sheet in its intermediary passes and sends it on to the "finishing roller" who not only finishes the sheet brass to the thickness desired, but is also held responsible for its surface, cleanness and, most important of all, its temper. Naturally the pay of the finishing roller is the highest of all, though many men are better adapted to the other two classes.

A bright, intelligent boy, quick to learn and not afraid to work can become a good breaking down or running down roller in six months, although it will be a year and a half to two years before he will be really competent.



SPRAYS OF WATER COOL THE BRASS SHEET, HOT FROM THE ANNEALING FURNACES

*From the Chase Diamond.

Nickel in Babbitt Metal

The Effect of Small Quantities of Nickel Upon High-Grade Bearing Metal*

By A. H. MUNDEY and C. C. BISSETT

The object of this note is to report the result of a practical investigation into the mechanical and wearing properties of a bearing metal of well-known grade, after the addition of small but increasing amounts of nickel.

That it has been the practice of some engineers and manufacturers to add nickel to white anti-friction or bearing metals has been fairly common knowledge. The actual object of this, however, has been the subject of some speculation, and possible controversy. It has been largely held that the original idea was not a metallurgical or even an engineering one, in the true sense, but to provide a means of identification of a certain manufacturer's metal after the bearing had been cast and taken into service, whether with success or otherwise. The practice was adopted in other quarters, thus destroying the original object of providing an identification or distinguishing sign, and as really excellent alloys were so treated, and as good results in running were obtained, some virtue gradually became attributed to the nickel content. Whether this story be true or not the authors cannot say, but it certainly obtained much credence in interested engineering circles.

No reliable evidence, however, appears to exist as to whether nickel in the small quantities usually found in these alloys played any useful part or not. Nor is there, to the knowledge of the authors, any reports of tests or experimental investigations available on the subject. The authors therefore decided to make a number of trial ingots of a thoroughly well-tried and reliable alloy, which is justly valued on account of its excellent mechanical properties, mainly its toughness, whilst it still possesses a very high and well-deserved reputation as a bearing metal. The alloy chosen was:

Tin, 93 per cent; antimony, 3.5 per cent; copper 3.5 per cent.

This alloy was reported upon by the authors in their paper on "White Metals," which was submitted to the Institute at the Autumn meeting in 1922. The test results are given in Table I:

TABLE I

Tensile Test		Brinell Hardness Number, 10 mm. Ball, 500 Kg.	Compression Test. Tons Per Sq. In.	
Tons Per Sq. In.	Elongation Per Cent. on 2 In.		Yield Point, 0.001 In.	Compressed to Half Length
5.12	11.6	24.9	3.569	14.732

For the purposes of the present trial a number of batches of this alloy were taken, in which 0.1, 0.2, 0.3, 0.4 and 0.5 per cent of nickel were included, in each case the nickel being made to replace a corresponding amount of tin, so that the antimony and also the copper content remained constant. In addition, a further cast of metal containing 1 per cent of nickel was made, but this also contained 4 per cent of copper and 3.5 per cent of antimony.

The greatest care was taken in order to ensure the correctness of composition, and the results were checked by analysis. The nickel was introduced in the form of cupronickel—20 per cent nickel, 80 per cent copper. The test-pieces for every test were cast under the most uniform conditions possible, and every precaution was taken to treat each batch similarly. The tensile and other test-pieces were poured at 350° C., cast into iron moulds heated uniformly to 100° C.

Specimens for microscopic examination were taken from a corresponding position from each ingot.

Bearings were cast for trials on the Thurston machines in exactly the same manner, and were machined, scraped, and fitted by fitters whose skill and precision of workmanship are beyond question.

The tensile test-pieces were made of the usual form, 0.564 in. diameter, acting length 2 in. The Brinell test was with a 500-kg. load, 10-mm. ball. The results are given in Table II.

The compression tests were 0.564 in. diameter, 0.5 in. high.

TABLE II

Specimen Mark	Nickel Content	Tensile Test: Tons Per Sq. In.	Tensile Test: Elongation Per Cent on 2 In.	Brinell Hardness Number	Compression Test. Tons Per Sq. In.: Yield Point, 0.001 In.	Compression Test. Tons Per Sq. In.: Compressed to Half Length	Final Length
B	0.1	4.6	18.0	19.3	2.85	...	0.235
C	0.2	4.6	12.2	21.5	2.85	...	0.223
D	0.3	4.4	6.1	22.3	2.57	...	0.25
E	0.4	4.6	11.0	21.5	3.0	...	0.218
F	0.5	3.6	5.7	21.5	3.07	...	0.242
G	1.0	4.1	15.4	20.1	2.57	...	0.242

(Also 4.0 copper)

The above tests do not compare very favorably with the original alloy. At any rate, they do not promise advantage in any direction. The compression tests were specially disappointing; all the speciments after taking a minute permanent set, at the loads given above, gave way completely when compressed to about 0.35 in. high, with a load of 10 tons, and sank without further loading to the heights given in the last column. The irregularity in the elongation is characteristic of alloys of this type, as they consist of a soft matrix with very hard constituents embedded. Heat-treatment tends to regularize, but it was not adopted, as it is seldom used in engineering works practice. Service conditions were aimed at.

The actual running trials were more encouraging. Each pair of bearings for the Thurston machine was tried at 25 lb. per sq. in. and 50 lb. per sq. in., the diameter of the journal being 1.25 in., speed 1,500 revolutions per minute, or approximately 500 ft. per minute.

The lubrication was constant and by pad application, a high-grade lubricating oil being employed. Each trial run was taken over 100,000 revolutions, the temperature of the bearing being noted at each 1,000 revolutions, the surface pull being also noted at the same intervals. Representative curves showing the course of trials are given.

It was noticed that in the case of the alloys containing nickel the oil became rapidly blackened, evidently by early abrasion of the bearing surface. After this had occurred rise of temperature became much less marked.

The running tests must, it is considered, be looked upon as satisfactory.

TABLE III

	Rise Per 1,000 Revs.		Surface Pull.* Average Lift Figure	
	25 Lb. Per Sq. In.	50 Lb. Per Sq. In.	25 Lb. Per Sq. In.	50 Lb. Per Sq. In.
A. Original alloy	0.95	1.05	0.0699	0.1228
B. Nickel, 0.1 per cent..	1.08	1.39	0.1228	0.1405
D. Nickel, 0.3 " ..	0.88	0.98	0.0963	0.1228
F. Nickel, 0.5 " ..	0.88	1.0	0.0875	0.0875
G. Nickel, 0.1 } Copper, 4.0 } " ..	0.6	0.95	0.0699	0.1228

*Indicated by tangent of angle of lift of pendulum during running.

*A note presented at a meeting of the British Institute of Metals, held on September 10 to 13, 1923, at the College of Technology, Sackville street, Manchester, England.

The Brinell tests were slightly lower than those obtained in the original alloy.

The comparison in the loss of hardness, due to rise of temperature, is interesting. (See Fig. I.)

TABLE IV.—LOSS OF HARDNESS DUE TO RISE OF TEMPERATURE

Alloy	Temperature 20° C.	40° C.	65° C.	90° C.	Remarks
A. Original alloy.....	24.9	24.2	23.6	22.8	Time of loading uniform, at ordinary temperatures, actually twenty seconds.
B. Nickel, 0.1 per cent..	19.3	18.6	18.1	17.4	
C. Nickel, 0.2 " .	21.5	20.8	20.2	19.4	
D. Nickel, 0.3 " .	22.3	21.6	21.0	20.2	
E. Nickel, 0.4 " .	21.5	20.8	20.2	19.4	
F. Nickel, 0.5 " .	21.5	20.8	20.2	19.4	
G. Nickel, 1.0 } Copper, 4.0 } " ..	20.1	19.4	19.0	18.2	

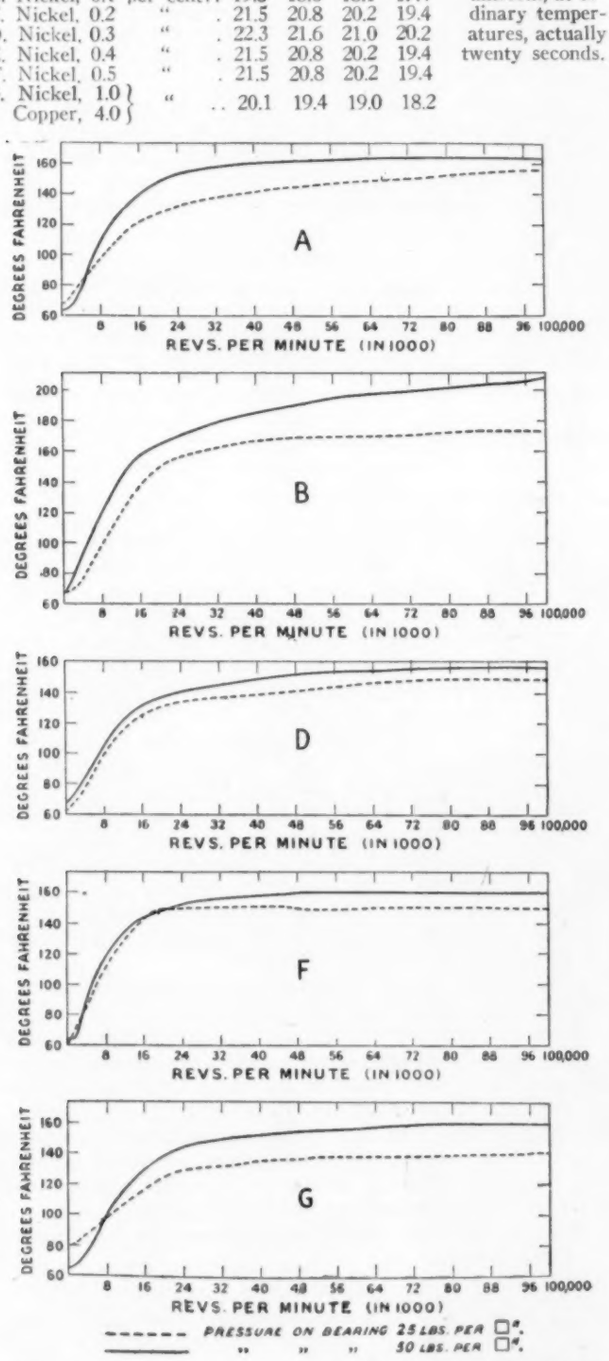


FIG. 1. LOSS OF HARDNESS DUE TO RISE OF TEMPERATURE

An examination of the photomicrographs (Plate I.) is interesting. The original alloy (Fig. 2) shows, very strongly marked, the copper-tin compound, this being the only striking feature of the structure; the antimony content being only 3.5, the whole of it is in solid solution in the tin. In the specimens containing even small quantities of nickel there is a great diminution in the amount and development of the copper-tin constituent, this being particularly marked in samples E and F (Figs. 3 and 4)), containing 0.4 per cent and 0.5 per cent of nickel respectively; whilst in G (Fig. 5) the revival of the copper-tin compound is very evident, this being the alloy containing 0.5 per cent more copper than the rest.

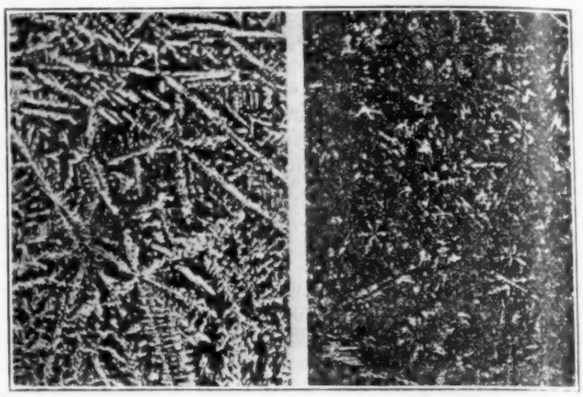


FIG. 2. ORIGINAL ALLOY WITHOUT NICKEL. X100

FIG. 3. ALLOY E, WITH 4% Ni. X100

It therefore appears that the presence of small quantities of nickel have the effect of combining with or dissolving in the copper present, and that the copper-tin compound is suppressed; hence the alloy loses that valuable property of resistance to crushing which it appears to owe to the interlocking of the copper-tin compound in its dendritic form, and the hardening effect, if any, of the nickel does not compensate for the loss of this form of structure. The authors hope that workers who have had the opportunity of making investigations in pure research on these metals will correct or confirm these impressions; at present the manufacturer is without precise information.

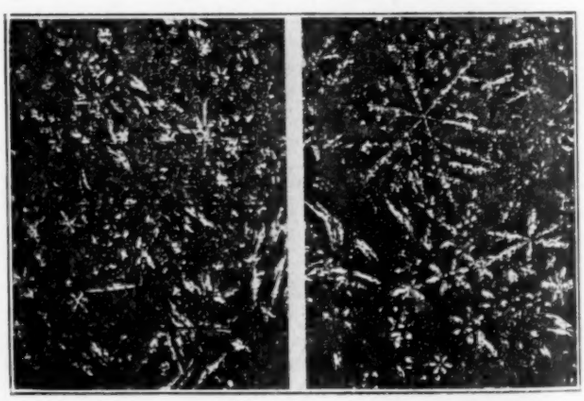


FIG. 4. ALLOY F, WITH .5% Ni. X100

FIG. 5. ALLOY G, WITH 1% Ni. X100

In conclusion, it would appear that the addition of nickel in such proportions to alloys of this character does not justify itself. No substantial advantages appear to accompany its use, and some valuable properties are diminished —unless it be that certain engineers have established faith in it. If it does give confidence, its use is in a certain measure justified. In the case of high-grade bearings of good design, the stresses are not likely to be so great as to cause failure by an overload, by crushing, although vibration or knocking may have a somewhat similar effect.

The actual value of nickel in such bearing metals is, it is thought, still to be proved.

The Molding of Small Flanged Tubes

The Advantages and Disadvantages of Molding with the Flange Above or Below*

Written for the Metal Industry, By R. E. SEARCH, Exchange Editor.

Small tubes or cylinders which possess a large flange at one of their extremities, when they are in bronze, or in manganese brass, should preferably be poured vertically or with the flange on top, or with the flange at the bottom. The latter arrangement is the more certain of good results; the first, method, however, is the most rapid, but it becomes inconvenient for the placing of the pattern—instead of rising gently from the bottom to the top, the metal falls abruptly and roughly into the mold, which tends to produce a waster. If, at the moment of pouring, the metal should not be very hot, such pouring may form fissures or cracks at the junction of the flange with the shank of the tube. The flange solidifies standing on the sand, the body of the tube contracts and the flange cannot follow it, thus a crack is produced. The damage done would depend largely on the quality of the sand employed; if the sand is refractory, very porous (meaning permeable) and plastic there will be little trouble. (In all such cases one of the most important precautions is overlooked and is not even mentioned in this text, and that precaution is this:

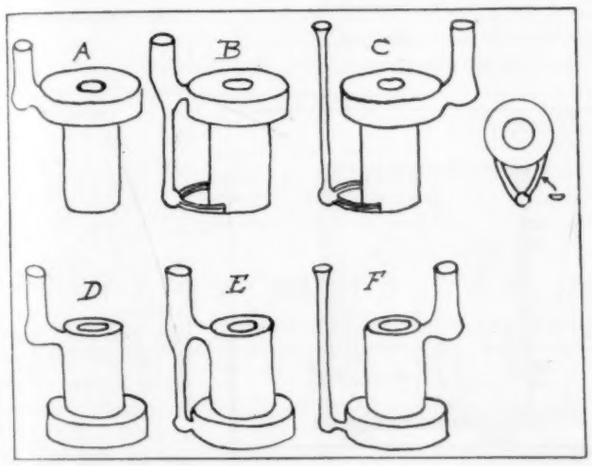


FIG. 1. SIX METHODS OF MOLDING A FLANGED TUBE

Wherever a horizontal and a vertical surface come together in a pattern, the two surfaces should be connected by a fillet, the heavier the section, the greater should be the radius of the fillet.)

In Fig. 1 six methods of molding this tube are shown. Method A is the most common. The molding is done in a two-part flask; to the pouring head there is given a heavy section so that it shall act as a dead-head. It is short, simple in form and is gated to the edge of the flange. The centering of the core is easily done. From the very beginning it is the method which offers itself to the mind of the molder who is not familiar with the particular requirements of pouring a bronze casting.

As it is essential to obtain a piece of the correct shape and contour, with a smooth skin, free from pits and blowholes or spelter marks, it is wise to take some useful precautions; among these being the proper metal (rather hot), and using molding sand that is very permeable and refractory.

The arrangement represented in B will be better than that of A. The prolongation of the pouring stream of metal to the base avoids the erosion of the mold by the metal. Generally the tendency is to enlarge the section of the pouring head, as shown. A diameter of 30 millimeters is sufficient, even for a relatively large piece. If the section is too large it becomes difficult to maintain the fullness of the pouring head, and then there is once more a failure of the metal at the moment of casting; with this inconvenience, as is known, erosion and sloughing away of the sand take place. If the metal is not fluid enough to pass by this counter-stream, it is also not fluid enough to furnish a perfect casting, whatever the size of the dead-head be.

At B, the dead-head is a prolonged enlargement of the pouring head; it is gated to the latter and to the flange by the conical part which facilitates the entrance of the metal into the mold. It is to be remarked that the pouring should be done at a moderate speed so that the metal may be withdrawn successively from the bottom, in other words, the molten metal should rise slowly but steadily from the bottom without agitation or disturbance. After the metal has reached the top level of the mold, no more metal should be added unless an unusual shrinkage appears to set in. The arrangement B again presents this appreciable advantage that the flange is formed of very hot metal, which, in addition, also supplies the dead-head; the hot metal feeds the piece better, and there will be less danger of piping.

The arrangement E presents the same advantage; but it also has besides the advantage of placing the flange at the bottom. It is, on the whole, preferable to that of B.

The arrangement C differs from that of B in this respect, that the pouring gate and dead-head are entirely independent of each other; thus it is certain that the metal will not rise precipitately to the top; for the reasons pointed out above, F, however, is preferable to C; it does not cost more to mold and it gives more certain results. The method D remains to be considered. There is nothing to recommend it; on the contrary, it presents several weak points, of which the principal one is the almost inevitable erosion of the mold by the descending stream of metal. Also, although in D the flange may be placed at the bottom, the arrangement shown at A is clearly preferable. In conclusion, it may be said that of the six arrangements shown in Fig. 1, E and F are the best, and of the two, E must be preferred, principally because it permits of the filling of the mold at a more uniform temperature and the arrangement promotes a regular shrinkage.

MAKING THE MOLD.

The pattern is first set on a mold board, with the flange placed at the bottom; over this put a flask

* Abstracted from La Fonderie Moderne, May, 1923. Since the setting-up of this article, we have had brought to our attention that both it and the article published in our September issue on "Bronze Bushings" were very similar to articles which appeared in Foundry some months ago by Charles Vickers. Upon investigation we found that Fonderie Moderne had re-written these articles without credit to either the author or the journal in which they originally appeared. This will, therefore, give full credit to Foundry and Mr. Vickers. The above article has, however, considerable material added to the original by R. E. Search, our exchange editor.—Ed.

which is made higher, if necessary, by the usual means. Sieve some sand over the pattern and work the sand around the pattern with the fingers, so as to bed the pattern firmly in the sand, and continue until the pattern is fully covered by the sand. Level off the flask with a metal bar or rod used as a strike, sprinkle a small amount of loose sand across the surface, and rub the surface smooth and true with the mold board gently across the surface so as to ensure a true contact of the surface of the board with the levelled sand surface of the mold. Then turn the flask over. The flange is now on the upper side of the mold. The surface of the sand, thus exposed, is now tested in order to discover its soft or hard spots which are attended to by additions of sand to the soft spots, and by removal of sand from the hard spots, and then the hard-rammed sand is replaced by some loose sand, and if this feature of the examination proves to be extensive the mold is made over again. If the ramming has been done in a skilful manner the surface is smoothed over with a slicker or trowel, or possibly with the palm of the hand (as some molders have a truly magic sensitiveness in the palms of their hands). Some dry sand is now added to perfect the contact with the mold board; finally the excess of sand is blown away by a bellows or removed by a camel's hair brush.

All of this work being done, the second part of the flask is set on its mate. The same process is repeated on this half of the pattern as before.

The pouring gate may be made in one of two ways: First, by the insertion of a rod of wood in the cope and mold it in with the pattern as the cope is molded up; or, second, by cutting the gate in the cope with a gate-cutter which consists of a cylindrical or oval shaped brass tube with a sharpened edge at its lower extremity. The tube is used as a sprue cutter after the cope is completed. In either case, before the molded wood rod or sprue-cutter has been withdrawn from the sand, the surface about the gate opening is enlarged with a sand cutter or by the thumb of the operator and rounded off; if necessary, moistened with a camel's hair brush, and made perfectly smooth, any loose particles of sand being blown away by the bellows.

After the mold is made and the pattern withdrawn, a verification of the mold is sometimes undertaken, where great accuracy of the shape and size are required, by setting the pattern back in the mold and withdrawing it again. The mold is then carefully examined to see if the original impression has been modified in any way. If any injury has been done to the mold by the process of verification the injury may be rectified by the use of a slicker, or by the infallible pressure of a skilful finger or even more skilful thumb or by the use of some other suitable tool with which a good molder is always provided.

In a mold of this sort the portion which demands the most care is the edge that is situated at the intersection of the two planes where the body of the tube and the surface of the flange come together. The well-made mold possesses there a well-rounded clearance—in foundry parlance, a good draft. In the absence of such a draft the sharp edges desired will surely be torn away in places in lifting out the pattern. In French practice it is sometimes preferred to form upon the pattern a suitable draft by means of a small, thin layer of plastic clay which can be carefully removed before the pattern is returned to the customer.

So far as circumstances will permit, it is preferable to give the runner a rectangular section, the large side of the rectangle being set horizontally; this lessens the danger of tearing away the sand at the moment when the molten stream divides to feed different portions of the mold from the same gate; at the same time there is avoided the formation of a cavity at the junction of the two metal streams; the cavity if formed would make the piece a waster.

Before closing the mold the core should be set in its position. If the precaution is taken to give the extremities of the core a truncated conical shape, it may be centered without difficulty in the imprint formed by the supporting ends of the core. A danger against which it is expedient to guard is the infiltration of the metal into the core vents, for if the vent passages are obstructed by entrapped or pocketed metal the outflow of the gas generated by the combustion of the core is obstructed, and the quality of the casting may be endangered. The gas referred to comes from the combustion of the core binder, which generally is an organic substance of some kind. In such a case blow-holes are generally to be found in the upper surface of the casting close to the core. It is therefore necessary to keep the air passages of the core free by protecting them against the entrance of the metal. A common means in the case under consideration consists in plugging with sand the vent at the extremity of the core, which will be placed at the lower part of the core. The bearing of the core, according to the above suggestion, is afterward crossed completely, as well as the mold, by a brass tube. The upper end of the core should be conical, as indicated in Fig. 2.

In the descent from the upper to the lower part and when the core is in position, by the opening referred to, the upper part of the core may be seen and the molder can be assured thus of its good or bad position. A cleaning rod of wood is pushed into the vent, some sand is gently rammed around the rod up to the top of the mold, and then the rod is withdrawn. It produces a regular vent traversing all above it and into which no metal can penetrate.

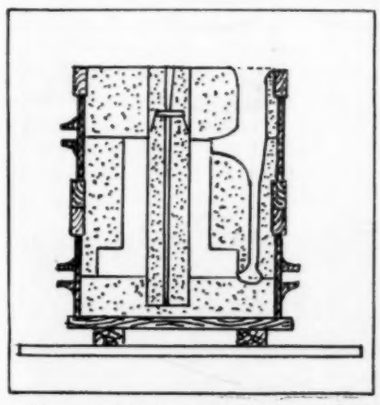


FIG. 2. SHOWING CONICAL UPPER END OF CORE

When the mold is weighted down to withstand the upward pressure of the rising molten metal it will be necessary to keep the vent open; to attain this object a slight passage is hollowed out beneath the weight in order to provide an outlet for the escaping air or gas.

In order to make a mold according to the method suggested at E Fig. 1, use is made of a three-part flask; if, as is frequently the case, there is not one at hand, another flask may be used for the middle section by a little ingenuity, but it is rare that such a flask section is lacking.

A good method of producing flanged tubes or cylinders of aluminum bronze is indicated in Fig. 3. As is to be seen, the pattern is set horizontally. The lower half of the piece (except the flange) is chilled by means of blocks of graphitic carbon set in the

lower part of the mold. The ends of the blocks are moistened with a water solution of sodium silicate, which makes it stick to the sand. The gate and the runner in the bottom may also be made of baked core sand and using sodium silicate as a binder, the cored gate is well indicated in the figure by the greater closeness of the dots; this gate may also be cut out of the green sand mold, but the cored-gate is much more resistant to the cutting or erosive action of the molten metal and therefore ensures a better casting.

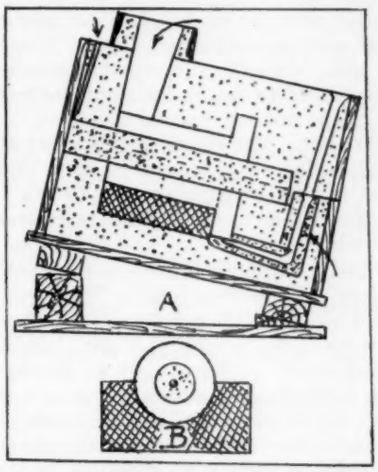


FIG. 3. GOOD METHOD OF POURING FLANGED TUBE

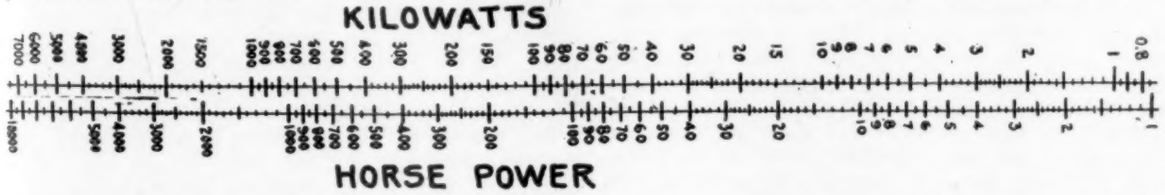
At B, in Fig. 3 there is indicated a sectional view of the carbon block. Such a block will last indefinitely if handled with care. On account of its comparative high cost it is expedient to take good care of such cores or blocks. Their object is to chill the lower part of the casting in order to solidify the piece before the dead-head freezes. By this means the dead-head fulfils its mission of being a reservoir of metal and at the same time performs its function with the least amount of metal. The carbon blocks are heated at the last moment before the metal is poured. On account of the high heat conductivity of the carbon this treatment is done readily and effectively. All that is necessary is to set one or two red-hot ingots of metal upon the exposed joint; this action heats the graphite block in a uniform manner, without burning it, and expels all latent moisture. Sodium silicate is resistant to a rather high heat and is not injured by this treatment.

As soon as the dead-head is solidified the mold should be opened and stripped, because an aluminum bronze casting should be cooled as rapidly as possible. The more rapidly the casting is cooled the more resistant the metal will be. Also the employment of graphite or carbon blocks is particularly recommended for heavy pieces that are to be slowly cooled.

In making coupon test bars that are attached to heavy castings, where it is desired to obtain the best possible results, both as to tensile strength and elongation, and thus to do the metal justice as to its representative physical properties, it will be found most desirable to mold the coupon portions of the casting in core-sand. The two halves of the core mold can be put together with a sodium silicate wash used as a binder. This method, of course, implies the necessity of baking the mold as well as the coupons, so as to cement the two halves of the coupon mold together.

A Kilowatt-Horse Power Scale

Here is a scale that gives the kilowatts in any number of horsepower in a jiffy. Or, it will give the horsepower in any number of kilowatts. As will be noted it is complete from 1 to 10,000 horsepower, within which range most powers are included.



For example, how many horsepower in 1,000 kilowatts? Just glance across from k. w. side to the h. p. side and there's the answer, about 1,340 h. p. Or, how many k. w. in 1,000 h. p? Glance across in the opposite direction and there's the answer again, about 750 k. w.

A chart could be made more accurate, no doubt, but this chart will very likely prove to be just as useful for ordinary work demanded of engineers.— W. F. SCHAPHORST.

Welding Aluminum

WELDING ALUMINUM AUTO BODIES

In a manufacturing plant where the oxy-acetylene process is used because of its convenience and the quality of work it produces. — OXY-ACETYLENE TIPS.

Proposed Suspension Bridge

With bronze encased cables, 11 feet thick. It is estimated that the bronze covering for steel will save $400,000 a year in upkeep. — COPPER & BRASS RESEARCH ASSOCIATION.

PROPOSED HUDSON RIVER BRIDGE

Wage Payment Systems

How to Reduce Costs in the Manufacturing Brass Business by Proper Wage Payment Methods

Written for The Metal Industry by P. W. BLAIR, Mechanical Editor

The National Association of Brass Manufacturers at their last meeting held in June appointed a committee composed of Messrs. Parks, Hills and Purdue, to revise the book gotten out many years ago by the association on how to figure costs in the brass business. I believe that all brass manufacturers are interested in reducing costs in manufacturing and anyone will agree with me that if he can achieve greater production with the same equipment, greater profits can be made. .

The first problem is that of wages. It must be taken into consideration that many compensation systems are in vogue throughout the brass manufacturing business and they must be regarded from their effects on the cost of production; their effect on the workmen; also the feasibility of applying the particular compensation scheme to the work involved. It is only human nature for a workman to do as little as possible for a fixed wage. It is equally due to our frail human nature that an employer will pay as little as possible for a fixed task. To bridge the chasm, innumerable schemes have been attempted. Although there is no hard and fast geographical division, yet for convenience one may divide them into the British plan and the American plan. The British plan deals with the co-partnership of labor and profit sharing. It is not within the scope of this article to go into this except to say that by no means have all of these schemes proved to be successes, and to advise the most careful study before attempting the experiment. The American plan deals with wage incentives to the worker and is based upon the ideal of obtaining for the employer low production costs and for the wage earner high wages.

The two most common method of wage payment are the time wage and piece systems. Each of these has great advantages and grave defects but every other system yet invented is a modification or a combination of these schemes. Time wage depends solely upon the length of time worked, the rate per hour for time and overtime being dependent upon local conditions. It has the great advantage of clerical simplicity and of being easily understood by the worker. It is flexible and is immediately applicable to all kinds of work. In fact in very variable work no other system can be applied except after careful and scientific study of the task. In certain kinds of work, such as pattern and tool making, where great skill or judgment is required, and extremely high quality is of greater importance than quantity production, no other form of payment can be used. It will be agreed that these disadvantages cannot be ignored. It offers practically no incentive to quantity production.

Because production is usually low under a time wage, unit costs are necessarily high, and one turns for relief to the second of the well-known systems, piece work.

Piece work has all the clerical simplicity of time work; it is as easily understood by the wage earner. In addition it provides a definite unit labor cost, and it pays the worker strictly according to the work accomplished. It decreases supervision but it increases inspection. It will be seen that piece work apparently overcomes the disadvantageous feature of time work, and it is undoubtedly true that in repetitive operations requiring no especial skill, piece work is probably the most suitable form of payment, provided always the rates are fairly set, and the conditions of work are, at all times, such, in the way of material, equipment and tools, as to make possible the rapid accomplishment of the work. A disadvantage of piece work is that it has so frequently been abused in the past by employers that the wage earner looks upon it with suspicion. Frequently in the past have workmen responded to the incentive of piece work only to find that if their earning exceeded a certain maximum, the rates were cut. The result of this short-sighted and demoralizing policy, has naturally been that the workman sets out to fool an employer as to what is a fair time to do a task. To overcome this, rates may be guaranteed, and should be.

Piece work rates are too frequently set on a foreman's guess or a general hunch. Sometimes they are based on past experience, but by any of these methods, the rates are probably wrong. If they are too low, the result is dissatisfied workmen and no increase in production. If too high the temptation to cut is very great, with the result mentioned. It has been suggested that beyond a certain high figure a list of discounts might be published, but this is merely a confession of guess rates.

In the case of a man running an expensive piece of machinery, direct labor is only one part, and sometimes a very small part of the total cost. All overhead and indirect costs are inevitably upon a time basis, and the great object of the employer should be not only to make the unit labor cost as low as possible but to reduce the unit time.

The fact that piece work rates do not vary in proportion to the speed of the operator, that the slow operator who carries the large time overhead obtains the same rate per piece as the fast operator with the small time overhead, led to the introduction of differential piece rates. In the Taylor differential piece work system, two piece work rates are given for each task—a high rate, where a certain minimum production is accomplished, and a low rate where the minimum is not achieved. Thus, the good workman not only received pay for the larger number of pieces he has produced, but he received a higher rate per piece. To illustrate this, if the standard set is to make 100 pieces in 10 hours, a low piece rate of 5 cents might be established, and a high piece rate of 7 cents. A man finishing 95 pieces in 10 hours would receive $4.75 while his neighbor would receive $7 for completing 100 pieces. The incentive of $2.25 for an addition of only 5 pieces is very strong.

The following illustration of the working of the system is taken from Taylor's book "Shop Management."

COST OF PRODUCTION PER LATHE PER DAY

ORDINARY SYSTEM OF PIECE WORK

Man's wages	$2.50
Machine cost	3.37
Total cost per day	$5.87
5 pieces produced	
Cost per piece	$1.17

DIFFERENTIAL RATE SYSTEM

Man's wages	$3.50
Machine cost	3.37
Total cost per day	$6.87
10 pieces produced	
Cost per piece	$ .69

The Taylor System immediately accomplishes two results. (1) It pays a wage not only commensurate with the amount of the work done, but also with the speed with which the work is done. (2) It proclaims unmistakably to the operators that the management far from thinking of cutting rates, actually pays an extra bonus on all the product when a man's daily wage exceeds a certain minimum.

This system has been epitomized by one writer as that system where "nothing succeeds like Success, and nothing fails like Failure."

The principles upon which Taylor based his system are worth repeating:

(a) A large daily task; each man in the establishment, high or low, should daily have a clearly defined task laid out before him. This task should not in the least degree be vague or indefinite, but should be described carefully and completely, and should not be easy to accomplish.

(b) Standard conditions; each man's task should call for a full day's work, and at the same time the workman should be given such standardized conditions and appliances as will enable him to accomplish his task with certainty.

(c) High pay for success; he should be sure of large pay when he accomplishes his task.

(d) Loss in case of failure; when he fails he should be sure that sooner or later he will be the loser by it.

When an establishment has reached an advanced stage of organization, in many cases, a fifth element should be added, namely, the task should be made so difficult that it can only be accomplished by a first class man.

The system has been criticized because it offers practically no incentive to the average man. Mr. Taylor's words quoted above answer this. This system was deliberately devised to attract only the very highest grade men, and to pay such men from 30 per cent. to 100 per cent. beyond the wages usually paid.

This method is eminently suited to cases where repetitive operations upon expensive machinery are involved. Its chief defect from some standpoints is the large amount of preliminary work necessary before it can be installed. It may well be said, however, that this preliminary work is of such great importance, so surprising in the waste it discloses and the economies it discovers from the first moment it is begun, that any system that brings executive attention to bear upon this work is well worth while.

The work preliminary to the installation of the Taylor system, or any other system where exact standards are necessary, is roughly as follows:

Standard times must be arrived at. Standards based upon past experience or upon a foreman's estimate are seldom sufficiently accurate for a system with so large a labor incentive. Methods of scientific research are applied to the work. First it is examined to eliminate all wasteful features whether of motion or materials. Then, painstakingly, the ideal process is built up. The proper sequence of motions is arrived at and recorded, and by means of elementary time studies, a standard time for the work is computed after making all necessary allowances for fatigue and unavoidable delays. The position of machines, benches and tools is made the most convenient possible, the best kind of appliances to use are carefully studied, the routing of work and material is carefully standardized, and no detail that affects the rate of production escapes minute examination.

The above work is the function of the Industrial Engineer. This profession has now won back the respect to which it was entitled. At one time, encouraged by the astounding success of the pioneers of the profession, a number of parasites unfitted by knowledge or aptitude for the work, called themselves "Efficiency Experts" and succeeded in installing a great deal of red tape without accomplishing any economy. Today, the profession has largely purged itself of the unfit, and does actually accomplish savings far greater than the substantial fees they are entitled to ask.

The Taylor system, then, is not an easy one to install. It assumes a factory management nearly 100 per cent. efficient and I do not think I disparage any one if I state that practically no one of us can lay claim to any such perfection.

Modifications of the Taylor system have been tried more or less extensively. For instance, a guaranteed minimum wage has been offered. In other cases, in place of two piece work scales as in the Taylor system, a graduated series of as many as ten steps has been tried.

The most widely used modification is that known as the Gantt Task and Bonus system, which was invented by a colleague of Mr. Taylor, and first put to use as a stepping stone to the more severe system. The following quotation from Gantt's book "Work, Wages and Profits" briefly describes the system:

"If the time allowed for a task is three hours, the workman who performs it in three hours or less is given four hours' pay. He thus has an incentive to do as much work as possible. If the workman fails to perform the task within the time limit, he gets his day rate. The time allowed plus the bonus is the equivalent of a piece rate; hence we have the piece work for the skilled and day work for the unskilled."

The plan is, in brief, a straight time basis up to the point where a workman produces standard production, and from that point onwards, a piece work basis.

Another plan that presupposes the establishment of an only slightly less highly organized system of factory management is that developed by Mr. Harrington Emerson, famous for his work on the Santa Fe Railway, and perhaps the most entertaining of all writers upon industrial management. With his system a graduated bonus is paid from the point where 65 per cent. of the standard is attained, and upon obtaining standard production a 20 per cent. bonus is paid. The standard is so set that it is possible to exceed it, and the bonus increases in like measure so that for 120 per cent efficiency the bonus is 40 per cent and for 150 per cent. efficiency the bonus is 70 per cent. In the earlier stages the bonus is very small.

An objection to the Emerson scale is the fact that the scale is not easily understood by the workers. This can be overcome by carefully worked out charts and tables. Other scales and plans like that of Knoeppel give greater reward at the lower efficiencies. Each one of the previous plans presupposes that the standard time has been set or scientifically arrived at. The Halsey plan was first introduced without setting standards by time study and although in every incentive time study is advantageous, yet many successful installations of this plan and the Rand method are running without any such elaborate preparations. It is interesting to note that F. W. Halsey was employed by the Rand Drill Company of Sherbrooke, P. Q., Canada, when he introduced his plan. It consists briefly of setting a standard time for a task, and should the worker take less than that time, to share with the worker the saving in time, the worker receiving his share at his regular rate per hour. This share is usually one-third or one-half. For instance, if the task set was required to be accomplished in ten hours, and the workman completed it in seven, he would have saved three hours. If his rate were 50 cents per hour, the saving would be $1.50, and his share of this saving would be 50 cents or 75 cents in addition to the $3.50 he would receive for 7 hours at his regular rate. Should the workman take longer than 10 hours he would be paid at his regular rate.

This plan offers considerable inducement to the wage earner and commensurate savings to the employer. It is

of very widespread use, and the offer of half the savings earned usually appeals to workers as being a fair proposition.

Another plan that has a great deal to recommend it is that known as the Rowan Plan. It is not so simple a method as the Halsey. It is more difficult to explain to the workmen, but it has the advantage of saving the employer from paying excessive rates in case an error in the standard time has been made. No matter how quickly a worker may perform his task, he cannot earn as much as double time.

In this plan the time saved is expressed as a percentage of the standard time, and that same percentage is added to the worker's time rate as bonus. Thus, if the worker saves two hours out of ten, his saving is 20 per cent. and he would receive for his eight hours work a rate increased by 20 per cent over his regular rate. This system will become clearer if it is remembered that when one-quarter of the time is saved, time and one-quarter is paid. When one-half the time is saved, time and one-half is paid. When three-quarters of the time is saved, time and three-quarters is paid.

A scheme that has been recommended as an improvement upon the Halsey or Rowan plans is that known as the Barth Premium plan. The workmen's compensation in this plan follows the Halsey 50 per cent. premium plan quite closely until about one-half the time is saved. At greater savings than one-half the worker's return is much less than in the Halsey plan though more than in the Rowan plan. It therefore offers to the employer a greater protection against badly set standards than does the Halsey but gives greater rewards for high savings to the worker than the Rowan.

The Estes organization recommends a plan known as the 100 per cent. premium plan. This method has the advantage of extreme simplicity in calculation. A task time is set and the worker receives one hour's pay at his regular rate for each task hour's work that he performs. In other words this is a piece work system cleverly devised to be upon a time rather than a dollar basis.

Various combinations of piece work and time work have been put into practice. For instance a time rate at one-half the usual figure might be offered together with a piece work rate at one-half the usual price, the worker receiving the sum of the two. This has the advantage of simplicity, and where a saving is made it is exactly the same as the 50 per cent. Halsey plan.

It would be an easy matter to describe a great many other schemes that have been invented, but the majority of them are adaptations of these touched upon. Some plans have wastage upon material into consideration but there is no difficulty in adjusting any of the plans described so that the worker would receive an additional premium for minimum waste, or a discount from his bonus for excessive waste.

Other plans aim to pay all the bonus to the foreman upon the assumption that he will share with the workers. Some take material into account, in which case the foreman becomes to all practical purposes a sub-contractor. Such plans have little practical application to the brass business and I would not recommend it or enlarge upon them.

I would conclude with a few general considerations.

(1) Take time and care to set your standards carefully.

(2) Guarantee that these standards will remain in force for a reasonable length of time; certainly not less than six months, preferably so long as there are not mechanical changes in the process.

(3) Give to your foreman, inspectors, adjusters and your indirect laborers a bonus based upon the average bonus earned by the direct laborers they serve.

(4) When direct bonuses cannot be installed—group bonuses are desirable.

(5) Keep your workers constantly under the influence of the incentive. This can be done by publishing weekly the previous week bonus earnings.

(6) Make your bonus payments every pay day. A long deferred reward loses its incentive.

(7) Do not cut rates merely because the workers' earnings are large. Such a result is the object of installing the system. Do not forget that your costs are decreased in more than like proportion.

(8) Lastly, make sure your workers thoroughly understand the system, and are convinced that it is fair. You cannot take too much trouble to make sure of this. A reputation for being fair is worth twice a reputation for being generous.

(9) No bonus system can take the place of management. A good bonus system may fail under bad management. Under good management that not only has efficiency but also personality and good will that will permeate the organization, a well chosen bonus system will there find its natural soil.

In conclusion, let me state that a properly designed bonus system not only pays according to effort, increases earnings, decreases costs but it also tends to cement the common interests of workers and employer, and it builds up for the latter an assent of loyalty and goodwill.

Electric Welding of Metals

The question of the applicability of electric welding to the non-ferrous metals came up during the discussion of the paper on "Arc Welding" presented to a recent meeting of the Staffordshire Iron & Steel Institute (England) by H. W. Wolton and R. W. Heasman. Only indirect reference was made in the paper to this part of the subject, but Mr. Berry, in the course of the discussion, asked for further information. He remarked that owing to the low temperature at which some of the non-ferrous metals melted it was obvious that with them welding must be a very difficult process. He would like to know how far that development had gone. The authors had mentioned that they were about to weld plates of 3/8" thickness. He would like to know whether they could weld thinner plates. He was particularly interested in material of 16 to 18 gauge, especially in aluminum.

Mr. Heasman, in his reply, pointed out samples of welding of copper and of brass amongst the exhibits shown in illustration of the paper. He said that the weld referred to in the paper was quite recent work and represented a class of work which had not generally been done; in fact, it was in a sort of experimental stage. He could not point to anybody who was using copper or brass welding as a commercial proposition, but perfect welding could be done in those materials. It was purely a matter of time and experience and he had no doubt that a great deal of work would be done in that direction. It was very necessary to preheat the copper before starting to weld. If the whole of the piece could not be pre-heated it would be necessary to heat it more or less locally at the point of starting and as the weld proceeded the current would generate sufficient heat to give a good deposit. The metal should not be put down too quickly and a sort of puddling action should be given to the end of the electrode. Otherwise a true deposit would not take place and a certain number of blow-holes might be left in the metal.—H.

Chromium Plating Steel

A Study of Chromium Deposition Using Chromium Anodes and the Properties of the Deposit*

By K. W. SCHWARTZ

EXPERIMENTAL

On account of the wide diversity of results and opinions of previous investigators, it was decided to study:

1. The effect of chromium sulfate concentration at various current densities.
2. The effect of hydrogen in concentration.
3. The effect on the deposit upon substituting chromium anodes in place of lead and of platinum anodes.
4. The extent of the passivity of the chromium anodes after prolonged electrolysis.

We also investigated the electrolytic corrosion of the chromium deposit, as compared to other metals and alloys, in such media as concentrated nitric acid, dilute nitric acid, sea water, molten tin, zinc and brass.

APPARATUS AND METHOD

In the cases where a two-compartment cell was used it consisted of an 800 cc. beaker, into which a porous cup was placed to act as a diaphragm. The outer chamber was filled with dilute sulfuric acid with a specific gravity of 1.12. The anode used was a sheet lead cylinder closely fitted around the porous cup. The cathode was either copper or sheet iron. This arrangement was used only in experiments where the conditions of Carveth and Mott were being duplicated. In all other cases a single cell was used. This consisted of a 600 cc. beaker with two anodes (usually chromium) suspended in the solution, preferably by means of chromium-plated iron wires. The anodes of chromium were prepared by the Goldschmidt process. They were approximately 5 x 3.7 x 3.7 cm. (2 x 1.5 x 1.5 in.) in size.

The chromium sulfate and chromic acid used were Eimer & Amend's "chemically pure grade." All solutions were filtered before using. Cold chromic acid solutions have little or no effect on the filter paper. The iron cathodes were electrolytically cleaned.

DISCUSSION OF RESULTS

Results of tests made on chromium sulfate solutions varying from 395 g./L. to 80 g./L. and current densities varying from 16 to 2.7 amp./sq.. dm. (150 to 25 amp./sq. ft.) were not encouraging. No satisfactory crystalline, adherent plate of chromium on iron was obtained. At the lowest concentration used (80 g./L), a uniformly distributed deposit of a green oxide of chromium was produced.

With high concentrations of chromium sulfate, 350-400 g./L., at current densities ranging from 2.7 to 16 amp./sq. dm. (25-150 amp./sq. ft.), with the hydrogen ion concentration varied by introducing sulfuric acid into the bath in increasing amounts, no satisfactory deposit was obtained. At any given current density, as soon as a definite hydrogen ion concentration was exceeded no deposit resulted. It appeared that the higher the acidity, the higher the current density required for the deposition of chromium from its sulfate solution.

We next tried out the solution recommended by G. J. Sargent[1], 245 g./L. chromic acid plus 3 g./L. $Cr_2(SO_4)_3$. The anode was platinum and the cathode copper. The current density was 10 amp./sq. dm. (93 amp./sq. ft.). A bright crystalline deposit was obtained which proved satisfactory in all respects.

In the next experiment an iron cathode was used and two chromium anodes were used in place of platinum. The cell was allowed to run for 22.5 hr. The voltage at the beginning and end of the run was 2.3 v. The current density was 10 amp./sq. dm. (93 amp./sq. ft.). The deposit was grey, adherent, crystalline and satisfactory. The temperature of the electrolyte was 25° C.; there was no stirring aside from that brought about by the evolution of hydrogen. The chromium anodes showed no tendency to become passive, as would be ordinarily expected since chromic acid is such a strong oxidizing agent. This appears to be in direct contradiction to the statement made by Hittorf and quoted above. It is possible that the presence of the sulfate ions counteracted the tendency for the anodes to become passive. The anodes lost appreciably in weight and took on a smooth, silky appearance as compared with the original rough and scratched surface, which had been produced by grinding on an emery wheel.

We next made a series of runs varying the concentration of the chromic acid, but keeping the content of chromium sulfate and the current density constant. It was found that good results could be gotten on iron, using chromium anodes, anywhere within the range from 200 to 400 g./L. of chromic acid. The best concentration was found to be 245 g./L. chromic acid plus 3 g./L. chromium sulfate, which solution was designated as "C."

Using this solution "C," the effect of current density was determined over the range from 2.7 to 54 am./sq. dm. (25 to 500 amp./sq. ft.). Good deposits were obtained up to about 16 amp./sq. dm. (150 amp./sq. ft.). Above this the deposits were dark at first and after continued plating showed signs of cracking. The best current density to use for a bright adherent deposit proved to be between 10.8 and 13.4 amp./sq. dm. (100 and 125 amp./sq. ft.), with the electrolyte at room temperature. See Table I.

TABLE I. EFFECT OF CURRENT DENSITY ON DEPOSITS

Solution: 245 g/L chromic acid, plus chromium sulfate 3 g/L. Room Temperature. Anodes, chromium. Cathode, Fe, with exposed surface of one sq. in. No mechanical stirring.

Sample	Time, Min.	C. D. Amp. 1 Sq.Ft.	Voltage	Description of Deposit
1	120	90	2.3	Crystalline and adherent.
2	60	45	2.3	Surface barely covered.
2	120	125	2.5	Very good, bright, adherent.
4	120	144	2.5	Gray, crystalline.
5	60	345	2.9	Dull, adherent, tendency to form yellow coating.
6	120	540	3.5	Gray at first, then turned yellow and finally cracked.

Cathode current efficiency tests were run with solution "C," using a copper coulometer in series, a current density of 13.8 amp./sq. dm. (125 amp./sq. ft.), chromium anodes and electrolyte at room temperature. A cathode current efficiency of 20 per cent was obtained for bright deposits. This, at first glance, would seem low, but is explained by the fact that together with chromium metal hydrogen is always evolved at the cathode.

Again using solution "C," a run was made to study the effect of temperature. The current density used for the

* Part of a paper presented at the Forty-fourth General Meeting of the American Electrochemical Society, held in Dayton, Ohio, September 27, 28 and 29, 1923. Abstract of thesis presented in partial fulfillment of the requirements for the degree of Chemical Engineer at Columbia University. A summary of this paper was published in THE METAL INDUSTRY for October, 1923, page 410.

[1] Trans. Am. Electro Chem. Soc. 9, 315 (1906).

room temperature run was 13.4 amp./sq. dm. (125 amp./sq. ft.). The deposit was satisfactory. On making a run at 55-60° C. and the same current density, no plate resulted after two hours' operation, although the evolution of hydrogen at the cathode was quite rapid. However, upon doubling the current density a good plate resulted at this higher temperature.

The above phenomena suggest the following explanation: Hydrogen was evolved in all of our plating experiments where metallic chromium was deposited, and it seems that the formation of a protective layer of hydrogen gas over the chromium is essential. At higher temperatures the tendency for hydrogen to escape and leave the surface of the cathode is much increased. To counteract this loss, hydrogen must be evolved more rapidly. To do this a higher current density is necessary. On making a determination of cathodic current efficiency, using a copper coulometer, it was found that at higher current density, using a temperature of 55-60° C., there was no increase in efficiency. Hence, nothing is gained in employing the higher temperature.

Another determination was made with the solution temperature at 6° C. Again current efficiency measurements, as described above, showed no increase in efficiency was obtained by operating at this reduced temperature.

The theory above also explains why low current densities can not be used in chromium plating, for with low current densities the hydrogen evolved is not sufficient to produce the protective layer needed to furnish the reducing atmosphere for preventing the newly-deposited chromium from dissolving with the formation of a chromous salt.

PROPERTIES OF CHROMIUM PLATE.

Exposure for weeks to the corrosive atmosphere of the laboratory produced no effect on the chromium plate, whereas iron corroded rapidly. Chromium-plated iron immersed in tap water for a period of three weeks showed no signs of losing its luster or of a tendency to corrode. Dipping the chromium plate into hot sulfuric acid or hydrochloric acid caused it to dissolve. Boiling in hot concentrated nitric acid for 2 hours produced no appreciable effect on the chromium plate.

TABLE II. TESTS IN AIR SATURATED WITH VAPORS

(a) Ammonia Vapor

Sample	Loss in Grams/sq. Cm./yr.
Cu	Gained in wt.
Fe	zero
Cr on Fe	zero
Al	zero
Duriron	45

(b) Hydrochloric Acid Fumes

Sample	Loss in Grams/sq. Cm./yr.
Cu	Gained in wt.
Fe	120
Cr on Fe	1262
Al	377
Duriron	70

(c) Conc. Nitric Acid Fumes

Sample	Loss in Grams/sq. Cm./yr.
Al	19.4
Fe	2290
Duriron	10
Cr on Fe	10
Ni	475

(d) Hydrogen Sulfide Fumes

Sample	Loss in Grams/sq. Cm./yr.
Fe	23.6
Duriron	Gained in wt.
Al	7.1
Cr on Fe	Slight gain

A series of corrosion tests on various metals in order to compare them with chromium plate under similar conditions was then undertaken. These consisted in exposing weighed samples in closed containers to air saturated with (a) ammonia, (b) hydrochloric acid, (c) nitric acid, and (d) hydrogen sulfide fumes for a period of 192 hours. At the end of this period the samples were again weighed and the loss or gain in weight per unit of surface per year was calculated. These are listed in Table II.

Table II shows that the chromium plate stands up well in ammonia vapor, nitric acid fumes and hydrogen sulfide fumes. It is practically on a par with duriron on exposure to nitric acid fumes. Hydrochloric acid vapor attacks chromium almost immediately.

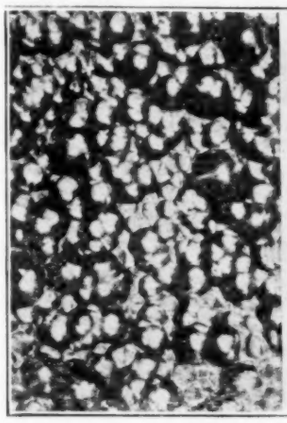


FIG. 1. COARSE CRYSTALS OF BRIGHT DEPOSIT X300

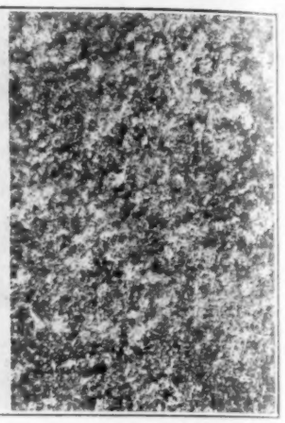


FIG. 2. FINE CRYSTALS OF DULL DEPOSIT X300

TABLE III. ELECTROLYTIC CORROSION TESTS

Current Density about 3.2 amp./sq. dm. (30 amp./sq. ft.)

Electrolyte	Anode Material	Loss in Grams/sq. Cm./yr.
Conc. Nitric Acid	Cr Plated Iron	32.2
Conc. Nitric Acid	Iron	28.1
Conc. Nitric Acid	Aluminum	51.8
Conc. Nitric Acid	Duriron	0.623
Dilute Nitric Acid	Cr Plated Iron	108.
Dilute Nitric Acid	Aluminum	51.1
Dilute Nitric Acid	Duriron	0.102
Sea Water	Cr Plated Iron	113.
Sea Water	Iron	110.

Current Density 1.6 amp./sq. dm. (15 amp./sq. ft.)

Electrolyte	Anode Material	Loss in Grams/sq. Cm./yr.
Conc. Nitric Acid	Cr Plated Iron	32.6
Conc. Nitric Acid	Iron	31.4
Conc. Nitric Acid	Aluminum	37.6
Conc. Nitric Acid	Duriron	0.453
Dilute Nitric Acid	Cr Plated Iron	31.8
Dilute Nitric Acid	Aluminum	37.5
Dilute Nitric Acid	Duriron	1.81
Sea Water	Cr Plated Iron	27.2
Sea Water	Iron	96.2

The effect of electrolytic corrosion of chromium plate as compared to other metals was then determined. The corrosive media used were solutions of concentrated nitric acid, dilute nitric acid (concentrated acid plus an equal volume of water) and sea water. Two runs were made, one using a current density of about 3.2 amp./sq. dm. (30 amp./sq. ft.) and the other using a current density of 1.6 amp./sq. dm. (15 amp./sq. ft.). Each extended over a period of 24 hours, weighings of cathode and anode being made before and after each run. The results obtained are recorded in Table III.

Tables II and III show that chromium does not stand up under electrolytic corrosion nearly as well as it does under atmospheric corrosion. Of the materials tested, namely chromium-plated iron, ordinary iron, aluminum and duriron, the last showed the smallest loss due to electrolytic corrosion.

We attribute the inability of chromium-plated steel to withstand electrolytic corrosion to a "breakdown" of the protective surface film by the action of the electric current.

With the aid of the current the acid ions will pass readily through the surface film and attack the virgin metal beneath, whereas in the case of atmospheric corrosion the migration of the acid through the film is extremely slow in comparison.

Under the microscope the chromium plate is uniform and free from holes due to occluded gases. Photographs of a bright, coarse crystalline and a dull, fine crystalline plate are reproduced in Figs. 1 and 2. The current density of the former was 13.4 amp./sq. dm., and of the latter 15.3 amp./ sq. dm.

Chromium plate has wearing qualities and hardness superior to ordinary iron, galvanized iron and tinned iron.

Chromium covered iron is not attacked by molten tin, zinc or brass, whereas ordinary iron disintegrates rapidly.

CONCLUSIONS

1. Good, adherent deposits of chromium on iron were obtained, using solutions containing 3 g./L. chromium sulfate and from 200 to 400 g./L. chromic acid.

2. The cathode current density range for good deposits was found to be from 9.3 to 16 amp./sq. dm. (100-150 amp./sq. ft.).

3. Best results were obtained using Sargent's solution containing 3 g./L. chromium sulfate, 245 g./L. chromic acid, and a current density of 13.4 amp./sq. dm. (125 amp./sq. ft.). The anodes used were chromium. The solution was at room temperature and stirring in addition to that caused by the evolution of hydrogen was found to be altogether unnecessary in the experiments carried on.

4. Chromium anodes in the above solution show no tendency to become passive even after long and continuous plating operations. Chromium anodes are cheaper than platinum and better than lead.

5. The simultaneous evolution of hydrogen with chromium deposition on iron is essential to good results. The hydrogen appears to protect the freshly discharged metal, and to counteract the great tendency of chromium to pass back to the chromous ion stage. This tendency is particularly marked in the strongly oxidizing medium of chromic acid.

6. Chromium plated iron and steel has a hard, bright, silver-like surface.

7. Chromium plated iron and steel resist atmospheric corrosion indefinitely.

8. Chromium plated iron and steel are resistant to the action of fumes of nitric acid, hydrogen sulfide and ammonia. They also resist the corrosive action of molten tin, zinc and brass.

9. Steel does not lose its temper during chromium plating.

10. Chromium plated iron does not resist electrolytic corrosion in mineral acids.

The writer wishes to express his sincere appreciation to Professor Colin G. Fink, under whose direction this investigation was carried out, and also to Professor Wm. Campbell and Dr. E. P. Polushkin for many valuable suggestions.

Plating Work Surface*

The term "work surface" applies only to that part of the surface of the work, or cathode, in contact with the electrolyte subjected to the direct action of the electric current; therefore, the work surface should not be confused with the thickness or ampere carrying capacity of the work, as the thickness of the work has no important bearing on the number of amperes required to plate the surface.

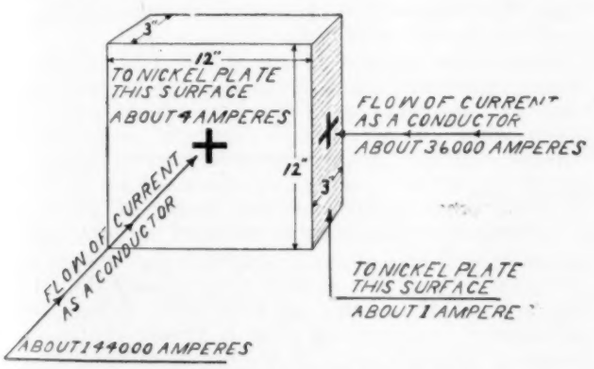


ILLUSTRATION OF "WORK SURFACE"

For example: This is shown by the ilustration, which represents a 3 inch piece cut from a copper bar having a cross section area of 12 inches by 12 inches (1 square foot or 144 square inches).

If this piece of copper were to be used as a cathode, or work to be plated, under ordinary conditions to nickel plate in a regular double nickel salt solution one only of its 12 inch by 12 inch surfaces would require 4 amperes, while, if this same piece were to be used as an electrical conductor with the flow of current passing through the 12 inch by 12 inch cross section, it would be capable of carrying approximately 1,000 amperes to each square inch, or a total of approximatey 144,000 amperes.

If this same piece of copper were to be used as a cathode, or work to be plated, under ordinary conditions to nickel plate in a regular double nickel salt solution, one only of its 12 x 3 inch surfaces (36 square inches or ¼ square foot), would require about 1 ampere only, while, if the same piece were to be used as an electrical conductor with the flow of current passing through the 12 inch by 3 inch cross section, it would be capable of carrying approximately 36,000 amperes.

These examples apply to all kinds of still plating solutions, excepting the number of amperes required to plate one square foot of surface, which varies according to the kind of solution used.

The following table gives the approximate number of amperes required to plate one square foot of surface of various metals in still plating tanks under conditions usually employed and the approximate ampere carrying capacity of different sizes of copper wire.

*From Bedell's Practical Electro Plating, reviewed in THE METAL INDUSTRY, October, 1923, p. 411.

Polishing Cast Iron Skillets

Cast iron skillets (frying pans) are finished by turning off the surface in a regular turning lathe. Proper chucks are used to hold the frying pans in the correct position for turning.

As a rule the turning operation is the only finish applied; if a smoother surface is required it will be necessary to polish by the aid of emery, oil and felt. This would have to be a hand operation as polishing wheels could not be used to advantage in polishing such a product.—C. H. PROCTOR.

Blushing

Its Causes and Methods of Prevention

Written for The Metal Industry by HUGO ZELLER, President of the Zeller Lacquer Manufacturing Company, Inc.

The art of successful finishing by means of lacquer products is often difficult especially for the inexperienced if certain fundamental rules and precautions are not adhered to. Since at least ninety per cent of all lacquering difficulties are due to errors of omission and commission which can be easily guarded against, it behooves the lacquer user to observe the needed precautions to have the assurance of good results at all times.

A difficulty encountered in lacquering under certain conditions variously termed "blushing," "clouding" or "white trouble" is the one dealt with here. This condition is one of the most disagreeable found in lacquering and is generally brought about by the inexperience or carelessness of the user. It appears as a white cloud or cast over the lacquer film which makes it dull and dead.

Blushing or clouding is caused by moisture from the air or other mediums, getting or being on the surface of the work **before** the lacquer is applied or **after** the lacquer is applied but before the lacquer film is dry. Most often this difficulty is created by moisture from the air, particularly when the moisture content of the atmosphere is large and the humidity high. When the weather is warm and the humidity high it is sometimes termed "muggy." A similar condition, with equally disadvantageous results, may be brought about by steam or vapor arising from plating tanks or tanks containing hot water for metal cleansing operations or from moisture in the compressed air used in spraying lacquers.

Many years ago, scientists, after being puzzled for centuries about the cause of dew on the ground evolved a solution which was called the "Dew Point Theory." This has long since been proved and accepted as a fact.

In a practical sense, what is the "Dew Point Theory"?

The atmosphere or ether surrounding the earth has normally a higher temperature than the earth or the products of the earth such as mineral and vegetable matters—metals, soil, coal, wood, etc. As an example, touch a piece of metal (not exposed to the sun's rays) on a warm day and you will find the metal much cooler than the air. There is always a differential in temperature between the air and the solids of the earth, this differential varying according to the conditions, climatic and otherwise. When this difference in temperature becomes too extreme and there is an excess of moisture in the air this excess is precipitated from the atmosphere resulting under certain conditions in what we call "dew". While we speak of this moisture as being "precipitated," the process is aided by the attraction of materials of the lower temperatures and the precipitate is proportionately heavier on materials having the lowest temperatures.

An example of the working of the "Dew Point Theory" other than the dew on the ground, and one which has been noted by almost everyone at one time or another is that under humid weather conditions, metal "sweats." This so-called "sweating" is moisture precipitated from the air and attracted to the metal. Other examples are the "sweating" of metal pipes containing cold water or liquids under these weather conditions, or the moisture which gathers on the outside of a glass containing a cold beverage under similar conditions.

The types of finishes most affected are the glossy ones such as polished silver, brass and copper, which are usually coated with clear lacquers having a high gloss. Finishes on other than polished metal surfaces, as for instance, glossy metallic powder finishes and glossy enamel finishes are similarly impaired by blushing. This is true in the latter case whether a glossy enamel alone or a flat or rubber enamel with a clear finishing enamel as a top coat are employed. Naturally, on dead, flat, matt, or even rubber finishes clouding is less noticeable.

When lacquer products containing fast drying solvents and diluents are used, the rapid evaporation of these **cool** the metal or other solid to which the lacquer has been applied and by increasing the attraction cause greater precipitation of moisture. Accordingly, the faster drying the nature of the solvents and diluents, the greater the precipitation, such precipitation varying according to the amount of excess moisture in the air. Take a little fast drying thinner in your hand and note how much cooler your hand feels after the material has evaporated. Products such as headache lotions which consist in good part of rapid drying liquids of this type are manufactured on this principle.

HOW TO OVERCOME "BLUSHING"

Before lacquering, dry thoroughly all work to be finished. Eliminate moist air from the lacquering room. Keep the compressed air, used in spraying lacquer products, free from water.

Many ways and means can be found to comply with these requirements and most of them are practicable, easy and inexpensive. The first precaution usually taken when the weather is "muggy" is to close all windows in the lacquering department. Unless the lacquering room is separately enclosed or partitioned off from other departments the closing of all windows is sometimes a hardship to workers in other departments as well as to those engaged in the lacquer room, even closing only the windows near where the lacquering is being done helps considerably. When this department is enclosed and there is proper ventilation by means of blowers, there is no serious discomfort when the moist outside air is excluded. Heating the lacquering room under bad weather conditions is a distinct aid in eliminating "clouding."

The articles may be warmed before lacquering as well as after lacquering. This is generally best accomplished by placing them in an oven, but care should be taken that the oven has a vent to allow the gases from the evaporating solvents and diluents to escape while the lacquered work is drying. Unless the oven has a suitable outlet for the fumes, its usefulness will be lessened since the lacquer film will then not have the hardness and toughness which it should have. Place the lacquered work in the oven as soon as possible after lacquering. If a slight cloud has appeared on the work before it is placed in the oven—the warmth will remove

it. A temperature of about 100° Fahrenheit in the oven is found very satisfactory. Some lacquer users utilize temperatures as low as 90°, others as high as 145° Fahrenheit for this purpose. In no event should high temperatures be employed since these would cause the lacquer film to bubble and sometimes (depending on the degree of heat and type of lacquer used) to darken. There are various types of steam, electric and gas ovens. Steam and electric ovens are regarded with most favor, but results depend somewhat on the make of the oven, the care exercised in its use, etc. The efficiency of an oven often hinges on how well the temperature can be regulated. Sometimes with steam and particularly with gas ovens, leaks may occur and impair the lacquer finish with blotches and blemishes.

The better spray equipment manufacturing concerns provide "air scrubbers" and "dryers" with their spray apparatus to eliminate moisture from the compressed air but these should be given frequent attention so that they function properly. The compressed air tank is customarily equipped with a valve at the bottom and this should be opened occasionally while the tank holds compressed air so that water accumulations in the tank may be blown out.

RETARDERS

Retarders, providing they are good retarders and not travelling under false colors when judiciously used, eliminate blushing or, even under the most extreme conditions, greatly lessen such difficulty. Retarders are combinations of solvents and diluents of a comparatively slow drying nature. They are used to replace the thinner in a lacquer mixture in whole or in part to slow down or **retard** the drying of the lacquer film. When the time of evaporation of the solvents and diluents in a lacquer film is comparatively slow the temperature of the metal or article on which the lacquer is applied is not lowered as is the case when there is more rapid evaporation, hence there is less clouding under otherwise the same conditions. There are retarders and retarders. It is obvious that the better the retarder the lesser quantity or proportion need be used in place of the regular thinners for results. It is unfortunate that the high boiling solvents and diluents such as amyl acetate, refined fusel oil, etc., entering heavily into the manufacture of good retarders are ordinarily rather expensive and at this writing almost prohibitive in price. On account of the high costs of these and other raw materials necessary to the manufacture of good lacquer products, reputable lacquer manufacturers have been faced with the problem of advancing prices sharply to maintain quality or cutting down on quality when substantial increases cannot be obtained. Doubtless due somewhat to these factors coupled with especially unseasonable weather conditions particularly during the summer and early fall, there has been created an unusual demand for information on "blushing" and ways and means to overcome this trouble, a situation which has prompted this article.

Even when other precautions are taken, it is well under acute conditions to eliminate drafts over the work which is being lacquered or over freshly lacquered work. Where spray application is made, the speed of the exhaust fan in the spray booth should be reduced if possible so as to decrease the draft over the articles being sprayed.

Sometimes, when there is clouding this can be overcome by applying another but light coat of lacquer over the cloudy finish. Best results in such a case are obtained by using mostly thinner in the mixture for this purpose and in some instances thinner applied alone is entirely satisfactory.

From time to time, preparations in the nature of a polish have been placed on the market, by various concerns, to overcome blushing but these have always been found wanting in one respect or another.

While in this article numerous ways and means to eliminate and overcome clouding have been taken up, it would be a very extreme case indeed which would require observance of all the precautions and remedies mentioned. Blushing can ordinarily be disposed of even without ovens if other precautions are taken, these precautions depending on weather conditions and working conditions.

CONCLUSION

Create favorable working conditions,
Eliminate moisture in every form.
Use **good** lacquers, and you will have no difficulty with blushing or clouding.

Streaky Brass Bedsteads

Q.—Can you tell us what is the trouble with brass beds that have been refinished in a dull brass or buffed, then hand rubbed with emery cloth, wiped and brush lacquered, stood in stock room for the past two months and are now covered with dark streaks, although there is lacquer on them and they are not shipped? We have re-lacquered brass beds for years in this same way and these were lacquered with fitch hair brushes.

A.—It is difficult to explain the cause of the dark streak in brass bed tubing that seems to develop after they have stood for a time. It is not due to your methods of manipulation in your finishing operations, viz.: cutting down and finally rubbing down with emery cloth, wiping down and lacquering.

Some years ago, 25 or more, the writer was employed as a plater in a large brass bed factory in Connecticut, and a similar trouble as you outlined occurred. The summer was a humid one, and we had endless trouble. The only logical reason we were able to decide upon was that there was an action between the iron casing of the tubing and the brass outer tube, due to moisture in the atmosphere. Upon splitting the tube and removing the brass, we found that the iron tube was badly rusted. We were of the opinion that the rust in some manner influenced the darkening of the outer finished brass surface. It seemed strange that this trouble only occurred in the humid months of summer time. I do not believe a remedy was ever found.

We were very careful not to heat up the tubing too much when cutting down with tripoli. I believe this helped some. We used oil and dry emery for rubbing down, and afterwards washed the excess of grease from the tubing with benzine. You might try some of your parts with this method and note results. Eliminate the cutting down, and just use the emery and oil, which should enable you to finish in one operation, unless the parts were badly scratched, too deep for removal by manual labor.—C. H. Proctor.

New Western Electric Cable Plant

Telephone Works in Kearny Will Cost More Than 20 Millions. Works Will Manufacture Cable and Telephone Switchboards. Employees Ultimately Will Number 30,000

Construction of the Western Electric Company's new cable and telephone switchboard plant on the 60 acre tract in Kearny, N. J., has begun. Work on the cable buildings and the 1,600 foot bulkhead on the Passaic River is well under way. The cable buildings will cost about five and one-half million dollars. They will have a capacity for manufacturing 210,000,000 conductor feet of loop cable per week. (Loop cable is used in connecting telephone subscribers with central offices and for trunk cables between central offices.) One of the cable buildings will be given over to armoring telephone cables for use by telephone companies under rivers and in harbors.

In the fall of next year the cable plant will be in operation. The initial machine equipment will have a capacity of about 150,000,000 conductor feet of cable per week, and at the outset approximately 600 people will be employed. Meanwhile at an added cost of fifteen millions of dollars the plant will be expanded to include facilities for the manufacture of telephone switchboards. This will be done by erecting at once a series of multi-story buildings. These will be six-story structures which will have a total floor space of approximately 693,000 square feet.

POSSIBLE FUTURE DEVELOPMENT OF THE KEARNY PROPERTY OF THE WESTERN ELECTRIC COMPANY

The buildings follow the same design as those developed at the Western Electric Company's Hawthorne Works at Chicago, Illinois, and will be finished in the fall and winter of 1925. The type and arrangement of the buildings are shown in the illustration. When these buildings are completed and in operation there will be approximately 5,000 employes on the payroll of the Kearny Works. At that time about one-fourth of the ultimate plant will be in actual operation.

To serve the manufacturing buildings there will be a power plant with an initial equipment of three turbo-generators, two each with a capacity of 1500 k.w. and one with a capacity of 5000 k.w. Ultimately there will be three 1500 k.w. sets and three of 5000 k.w. capacity. In such a large manufacturing establishment it is necessary to provide space and facilities for other general departments besides those actually engaged in manufacturing. The offices of the Kearny Works' manufacturing organization will be on the upper floors of the six-story buildings. Accommodations will be provided for the Installation Department and also warehouse and office space for the Merchandise Department. A hospital and a restaurant are also included in the ultimate plans. Provision for employes' recreation and amusement such as baseball diamond, tennis court and the like, have been made. It is quite possible, too, that water sports will be included.

W. R. Kattelle, the Western Electric Company's architect, is in immediate charge of the plans and execution of the work on the new plant. McKenzie, Voorhees & Gmelin are the consulting architects, with the J. G. White Engineering Corporation and Charles W. Staniford acting as consulting engineers.

In planning the Kearny Works careful consideration was given to the definite ultimate development of the plant of which the initial buildings will be but a part. Should the demands on the Western Electric Company for communication equipment increase in the next twelve or fifteen years as they have in the last decade, there will be required additional manufacturing space equivalent to the total development shown for the ultimate Kearny Works, and then about 30,000 people will find employment in the big plant on the meadows. However, plans for the ultimate development have been worked out so that it would be practicable to suspend building operations at any one of the several stages and still have a well arranged group of manufacturing buildings.

Because of the large proportion of manufactured products that are used by the telephone companies on the eastern seaboard an eastern location for a telephone plant is logical.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

WARS, EARTHQUAKES AND ACCIDENTS

The world was shaken by a war, and in the comparatively short time that the United States was engaged in it, 50,000 of our men were killed. The country has felt the loss but goes on. Japan, shattered by an earthquake, has lost an indeterminate number of thousands but will also recover. Earthquakes like that occur seldom.

Accidents in the United States in 1922 resulted in 75,300 deaths, an increase of 2,000 over 1921, according to the National Safety Council. Although there has been a somewhat halting decline in the accidental death rate for the past ten or twelve years, the actual number of fatal accidents has never been less than 70,000 each year.

What does this mean? It means that every year we have a war or an earthquake. Every year through carelessness, ignorance and neglect we lose over 70,000 lives.

The report credited the automobile with the largest entry in the annual accident mortality budget—14,000 for 1922, 18 per cent of all fatal accidents for that year. The committee estimated that during each day in 1922, 206 American citizens were killed by accident. Of this daily number, 38 were automobile fatilities. Accidental falls ranked a close second with 35. Drownings and burns totaled 19 and 16 respectively.

A thin silver lining appears in the announcement by Dr. George Payne of New York University, that the railway coach and the Pullman car were the safest places in America.

"No greater achievement has been made in welfare work than that made by the railroads in handling the accident situation," Dr. Payne said. "They have made railroad operation so safe that a person actually is in less danger traveling on the modern railroad than he is walking in the streets. The railroad Pullman and coach are the safest places in America today."

The fact that other countries have large numbers of deaths by accidents is a poor excuse. It is commonly admitted that our besetting national sin is carelessness. Advances in railroad passenger safety should point the way. The National Safety Council has been carrying on a vigorous campaign for education and legislation, both in public places and factories. It deserves support in every possible way.

HENRY FORD AND ALUMINUM

In the business reports of our October issue we printed an opinion from Henry Ford of Detroit, which read as follows:

Henry Ford has declared in an interview that aluminum will take the place of iron to a greater extent in the future. "Every clay bank has aluminum in it and we are going to take it out," he said.

"When will you begin to do this," he was asked.

"When we get Muscle Shoals. Aluminum will do the thing which I always have wanted to do for the Ford car," Mr. Ford added, "make it lighter. It is top heavy. It has 30 pounds of 'water' in it, and if I can eliminate that I can make it much lighter. But in the meantime iron will play its basic part in industry for a long time to come."

In addition to this, a news item in the New York Journal of Commerce states that the Florence Mining and Milling Company of Utah and the Detroit Aero Metals Company had entered into a contract for the sale and purchase of alunite—K_2SO_4. 3 $Al_2(OH_4)SO_4$—which contains both potash and aluminum. The contract calls for the daily delivery of 340 tons of raw alunite for the plant now under construction and this states, moreover, that this plant is but one of sixteen similar units to be installed.

This news is interesting and becomes even more so when it is stated that Mr. Ford had previously made arrangements with the Florence Company for his alunite supply contingent upon his obtaining possession of Muscle Shoals.

It seems to be generally believed that if Mr. Ford obtains Muscle Shoals, he will manufacture not only nitrates and potash, but also aluminum, and it is rumored around Detroit that he is behind the Detroit Aero Metals Company which is a sort of forerunner of the extensive operations to follow. The Detroit Aero Metals Company has a patented process of manufacturing potash fertilizer from alunite. No information is forthcoming, however, about the extraction of aluminum, which leaves us in the position of merely guessing again.

The situation as it stands then is simply this: aluminum exists in every clay bank but so far, at least, it cannot be utilized in that form. The present process of making aluminum, and the only commercially successful process, requires bauxite ores containing at least 50 to 55 per cent alumina. These requirements must also exist for Henry Ford if he is to produce aluminum commercially, unless he has unearthed a genius who has discovered a way of making aluminum by a new, better and cheaper method. Conflicting experiences in the field of metals and Mr. Ford's record as a successful manufacturer prompts us to decline to venture any predictions. It will be enlightening to watch developments.

SPANGLES ON ZINCED IRON

In our October issue we published an abstract of a paper read before the British Institute of Metals entitled Crystallization Effects on Galvanized Iron, by Hannah and Rhead. The conclusions reached by these investigators, which were so interesting as to call for further comment, are as follows:

1. "Spangle" is independent of the nature of the steel sheet.
2. Pure zinc alone is incapable of producing spangle.
3. Additions of tin or aluminum alone do not determine the production of spangle.
4. The addition of lead or bismuth facilitates the production of spangle.

5. The presence of lead facilitates corrosion, possibly by setting up galvanic action.

6. Added lead or bismuth is segregated in definite areas of the coating, and this segregation forms the essential mechanism of spangling.

Note that in the first place the nature of the steel sheet has no effect on the spangles. This at once eliminates one of the commonest excuses of the galvanizer or zincer—that "the sheet is no good."

In the second place pure zinc will not produce the desired spangles nor will the addition of tin or aluminum alone help. Flanders, in his book, Galvanizing and Tinning, mentions the use of aluminum, but only as a flux. Lead additions, however, produce good spangles at a temperature of about 55° F. above the melting point of the zinc. Bismuth could be used but such a consideration is rather theoretical because of its high price.

The mechanism of spangling seems to be the segregation of definite areas on the coating, of lead or bismuth. The size of the spangles, it seems, can be controlled by regulating the position of the sheet and the rate of cooling.

It should be noted, however, in addition, that the presence of lead facilitates corrosion by hydrochloric acid and sprayed salt water. The obvious conclusion is, therefore, that spangled zinc coatings are not so durable as material which has been coated with pure zinc.

It would be interesting to hear the comments of practical zinc coating men and of users of large quantities of this material.

CHROMIUM DEPOSITION

The article in this issue on Chromium Plating Steel, by K. W. Schwartz, should interest every manufacturer and user of plate steel. For some time efforts have been made to plate chromium. It has been known that chromium had unusual qualities, it is hard, non-corrosive and durable. However, the pure metal is so expensive and so difficult to work that its use has been out of consideration. A cheap base metal plated with chromium may solve the problem.

It is noteworthy that the most satisfactory results listed in this paper were obtained with a simple solution and under comparatively easy operating conditions. With an electrolyte of 200 to 400 grams of chromic acid and 3 grams of chromic sulphate per litre of solution, at 2.3 volts, with 100 to 150 amperes per square foot and at room temperature, good deposits were obtained. It is stated that the plate resists atmospheric corrosion indefinitely and that it is also resistant to the fumes of nitric acid, hydrogen sulphide and ammonia. What is even more unusual is that it is resistant to molten tin, zinc and brass.

Whether it is by this process, or some other, chomium plating promises to be one of the most interesting developments in electro-metallurgy in the near future.

Technical Publications

A STUDY OF WATER-LINE CORROSION

By Kenneth M. Watson †

Experiments were carried out to determine the cause of waterline corrosion. Strips of zinc, copper and brass were partially submerged into various corrosive liquors. Results indicate that although the depolarizing effect of oxygen is necessary for the corrosion of many metals in certain solutions, the contact of air with the upper surface of a liquid is never directly responsible for the occurrence of water-line corrosion. This phenomenon is caused by the slow downward flow of the heavier film of corrosion products along the surface of the metal, which draws in at the upper surface of the liquid a supply of fresh solution. Since all the metal except that at the surface of the liquid is in contact with partly exhausted solution, corrosion is most rapid at the surface. Although there is an even greater circulation of solution down the face of anodes used in the plating and refining of metals, water-line corrosion does not take place.

SOME RELATIONS BETWEEN THE MICRO-STRUCTURE OF METAL SURFACES AND ELECTRODEPOSITS MADE THEREON

By A. Kenneth Graham †

This paper presents further evidence of the influence of the structure of the base metal on electrodeposits. A distinction is made between primary influence or true reproduction and secondary influence or the effect of this reproduction on the deposit at large. Where reproduction is obtained large crystals in the base metal produce the most marked secondary influence on the electrodeposit. Reproduction of the structure of both copper and brass base metal, but not of nickel, was obtained in copper deposits. Results obtained with nickel deposits on both copper and nickel base metal are uncertain, owing to the difficulty experienced in attempting to reveal their structure upon etching.

†Abstract of a paper presented at the Forty-fourth General Meeting of the American Electrochemical Society in Dayton, O., September 27-29, 1923.

THE CRYSTALLINE FORM OF ELECTRO-DEPOSITED METALS

By William Blum and H. S. Rawdon †

A simple theory of the probable mechanism of crystal formation in electrodeposition is outlined. The principal types of crystalline structures observed in electrodeposits are classified and the conditions which tend toward the formation of the different types are discussed.

SPONTANEOUS IGNITION OF METALS IN OXYGEN UNDER PRESSURE

By S. S. Sakowsky and E. W. Butzker*

This preliminary report deals with the effects of oxygen pressure on the ignition temperature and combustibility of iron, copper, brass and lead. The purpose of this research is to obtain technical data that will serve as a basis for safety precautions. A general outline of the problem has been given in the first report (Serial 2507).

While the quantitative value of these data is comparative rather than absolute, they may serve as a guide to the best materials to use in industrial oxygen practice. Under high oxygen pressures, iron and steel burn very readily and completely, and if once ignited propagate a flame with almost explosive velocity. On the other hand, brass and copper appear to burn only very slightly, usually melting off and dropping in small metallic globules to the bottom of the bomb. With brass, a slight combustion of the wire apparently takes place, and from one-tenth to one-fourth of the wire is sometimes consumed.

As far as the industrial application of these data is concerned it would seem that the use of iron or steel in the construction of manifolds, etc., might be a dangerous practice once the material is raised to its ignition temperature. It seems probable in the light of these experiments that copper, and perhaps brass, would survive a higher temperature than steel.

*Serial No. 2521. Reports of Investigations, Bureau of Mines, Washington, D. C.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

Polishing Aluminum

To the Editor of THE METAL INDUSTRY:

I read, with interest, in the October issue of your valuable magazine, an answer to a question in "Shop Problems," on polishing aluminum* in which you state, that if the methods and manipulations used in polishing and buffing brass castings are adhered to in polishing aluminum, similar results will be obtained.

As a polisher of over twenty years' experience, a number of which I have spent in polishing aluminum castings and sheet aluminum in the form of cooking utensils and vacuum cleaner attachments, I want to say that, as a result of my experiments, I have found that such is not the case.

In the first place, aluminum is a much softer and a more porous metal than brass, and for that reason, a polisher should never use a dry roughing wheel on aluminum, such as is used in roughing out brass castings, for the reason that a dry roughing wheel drags the pores of the metal and puts marks in it that cannot be buffed out.

In the second place it is unnecessary to use a tampico wheel when polishing brass or aluminum as a second operation. This is merely a waste of time, material and energy, without any beneficial results. Furthermore it is not necessary to use a canton flannel wheel for the coloring operation, or fine gold rouge powder, as a final polishing medium, unless a very high grade watch case finish is desired. Just as good results may be obtained with the aid of open buffs providing the face of the wheel is combed out frequently to keep it soft, and a good grade of white lime finish applied sparingly.

Briefly stated, the method I recommend in polishing aluminum castings is as follows:

1. Polish by the use of soft canvas wheels, or wheels made by gluing a number of sections of stitched buffs together, the number to be determined by the width of wheel desired. To make these wheels, put the number of sections desired on the polishing machine, making sure they are properly balanced. Trim the wheel down to a smooth face and before taking wheel off, make a mark across the face of the wheel, then glue each section together on both sides, using a light glue, and using this mark as a guide to assembling. Then place in a press over night to dry.

It is a good idea to put each section on a piece of pipe the size of the arbor hole, when gluing them together, so that the holes in all the sections will be in line. Otherwise your wheel will have a wobble to it.

The number of emery to be used depends on the quality of the castings, but it should not be necessary to use anything under No. 90. As I said before, this wheel should not be used dry, but should be kept wet or greasy by the use of fat or tallow such as is put up in small round cartons, and may be obtained from any of the polishing supply houses. The emery should be applied in the usual way, by coating the wheels with a good grade of glue and then rolling them in emery.

While on this subject I must say that too much care cannot be given to the operation of heading the wheels with emery. I find from my own observations a great many polishers and some who are considered first class mechanics, pay very little attention to this very important part of their day's work. If every polisher would see that the emery is thoroughly mixed with the glue in rolling his wheels, he would find they would last much longer and he would complain less about bad glue and emery, not to speak of the saving there would be of these materials and other results that would be automatically obtained.

2. Cut down with tripoli composition as described in your third operation. The same rule as in the coloring operation would apply to the cutting down operation, namely, that of keeping the wheel soft to prevent clogging with tripoli. This would give the wheel a faster cutting service. Should the operator, in cutting down, find the wheel marks cannot be taken out, it would be necessary to go over them again, the same as in the first operation, only with a finer grade of emery, say No. 120.

After cutting down, the castings may be washed in benzine and dried in sawdust, or in a hot solution of naphtha soap and water, and rinsed in boiling water.

The work is now ready for the final operation as far as the polisher is concerned. This is done by coloring as before stated, with a soft open buff, and a good grade of white lime finish judiciously applied, so that the wheel won't smut.

I am sending you under separate cover, two sample pieces of aluminum, one piece finished in the method above described, the other polished on one side with a No. 90 grease wheel, the other side polished with a No. 90 dry wheel, so that you may judge for yourself which is the proper and most efficient method to obtain the desired results.

HARRY T. ROBERTS.

Philadelphia, Pa., October 18, 1923.

* Polishing Aluminum, p. 413, October, 1923.

To the Editor of THE METAL INDUSTRY:

Thank Mr. Roberts for his valuable suggestions covering the polishing of aluminum based upon his many years of practical experience. I shall be pleased to adopt his revision of my ideas covering the method and believe that inquirers will be benefited thereby.

He will kindly note that the inquirer desired a **Mirror Finish** equal to fine nickel plated surfaces. It was for the reason that my answer was more elaborate in detail than would have resulted if an ordinary polished aluminum finish had been desired.

CHARLES H. PROCTOR.

New York, October 25, 1923.

NICKEL ITCH

To the Editor of THE METAL INDUSTRY:

Seeing your inquiry asking for remedy for platers and nickel itch, I wish to say a few years ago one of my men had a severe attack of itch on both arms. It looked as though it had started with small white blisters and caused a terrible itch.

He could not get any sleep and at the time this happened he was doing nickel, silver and gold plating.

I recollect that one day he had occasion to use a mercury dip, and, having a very large tray to silver plate and the tank not being large enough to dip it in, he used a sponge. The constant dipping of his hands into the mercury and using the sponge resulted in what I would call the plater's itch. I think the use of cyanide and mercury brought this on. He tried everything he could think of and also called on several doctors. They gave him all kinds of salves and solutions without any satisfactory results.

The young man was told by several doctors to give up this kind of work as it would go through his system, and some day be the cause of his death. However, he stuck to his job and he has never had any further trouble.

I happened to have a bottle of C. N. solution which is sold in the market under that trade name for all kinds of disinfecting. I took a basin of warm water and put in one teaspoonful of C. N. and after a few applications during the day he seemed to be relieved of the itch. It probably took a few weeks before he was entirely relieved. Ever since, we have always had a bottle of C. N. in our plating room, and everyone who works in the plating room uses it three or four times a day. We have not had any further trouble.

During the winter months, a plater's hands are wet most of the time and the hands crack from not having time to dry

properly. Of course, if cyanide and acids get into these cracks, they cause some very bad sores, but by dipping your hands into the C. N. solution, they will always be kept in good condition.

I hope you will send this information to all who are suffering as I know what this solution will do. It is good for almost any kind of sores. I do not think that the people who manufacture the C. N. know the real value of it. A twenty-five cent bottle would probably last a month in your plating room but be careful not to make it too strong.

Yours very truly,

GLOBE ART MANUFACTURING COMPANY,
JOSEPH LANDSMAN.

Newark, N. J., October 16, 1923.

New Books

Kent's **Mechanical Engineer's Handbook.** By Robert T. Kent, Editor-in-Chief. Published by John Wiley & Sons, Inc. Size 4½ x 7, 2247 pages. Price payable in advance $7.00, (genuine leather binding), and $6.00 for Atholeather binding. For sale by THE METAL INDUSTRY.

The 10th edition of this standard handbook is an event of considerable importance in engineering literature. It is altogether unnecessary to describe the virtues of the book since it has even been called the "Engineer's Bible." The reviewer will confine himself, therefore, simply to describing the changes and additions in its contents which will appeal to those interested in metals.

Strength of Materials. Entirely new text has been written for this edition on the tests of metals and materials, testing machines, impact tests, Moh scale of hardness, effect of temperature on the strength of metals, tables of strength of various materials, effect of temperature on the strength of metals.

Corrosion. A new chapter has been written on this topic covering theory, factors influencing corrosion, the corrosion of wrought iron and steel pipe in hot water service, effect of corrosion on wrought manganese bronze under tensile stress, protective coatings for pipe, corrosion of non-ferrous pipes, phosphate coatings for rust proofing iron and steel.

Non-ferrous Metals and Alloys. A new chapter has been written covering copper, zinc, cast alloys, wrought brass, bronze, nickel-silver alloys, bearing metals, aluminum, nickel, resistance alloys, magnesium, molybdenum and die-casting alloys.

Heat. New sections have been written on the following: temperature scales, gas pyrometer, radiation pyrometer, resistance pyrometer, thermo-electric pyrometer, protection of thermo-electric couples; tables showing the type of pyrometer for various industrial operations; true temperatures corresponding to apparent temperatures measured on radiation pyrometers and optical pyrometers.

Heat Insulation. This chapter is new and covers, among other things, commercial insulators, transfer of heat across air spaces, high temperature and furnace wall insulation; tables: heat loss through metal in encased furnaces, thermal conductivities of refractory brick, heat loss through high temperature walls.

Fuels and Combustion. A chapter on this topic is also new and covers, among other things, purchase of coal under specifications, colloidal fuel, pulverized fuel, burning of fuel oil, natural gas, coke oven gas, coal gas.

Industrial Furnaces.—An entirely new chapter has been included on this subject.

Foundry Practice. This chapter includes molding sand and molding machines.

The authority with which this handbook speaks is attested to by its contributors, many of whom are familiar to the metal industries. Among them are: Bradley Stoughton, P. D. Merica, W. M. Corse, W. H. Bassett, Zay Jeffries, C. H. Mathewson, C. A. Bierbaum, John A. Gann, John F. Thompson.

No engineer in any field can afford to be without the latest Kent.

A. S. T. M. Standards Adopted in 1923. Published by the American Society for Testing Materials. Size 6 x 9. Price payable in advance $2.00. For sale by THE METAL INDUSTRY.

This is the second supplement to the 1921 book on A. S. T. M. standards, (issued triennially) in the form of a 126-page book containing 20 standards adopted in 1923. Among the standards which appear in this pamphlet are:

B 1-23, Specifications for Hard-Drawn Copper Wire.
B 29-23, Specifications for Pig Lead.
B 42-23, Specifications for Copper Pipe, Standard Sizes.
B 43-23, Specifications for Brass Pipe, Standard Sizes.
B 41-23, Methods of Chemical Analysis of Nickel.
B 45-23, Methods of Chemical Analysis of Brass Ingots and Sand Castings.
B 46-23, Methods of Chemical Analysis of Bronze Bearing Metal.

Engineering Non-Ferrous Metals and Alloys. By Aitchison and Bartley. Published by the Oxford University Press. Size 5½ x 8½, 300 pages. Price payable in advance $7.00. For sale by THE METAL INDUSTRY.

There are by this time many books on non-ferrous metals. This book, however, takes up the subject from a different angle from most of the others. It is not merely a book on the metallurgy of non-ferrous metals but the metallurgy of these metals as applied to engineering practice. This difference makes the book of unusual interest and value since all information included is written with an eye to direct use. The book is more than merely "practical," however. It is not only a compilation of simplest facts in the handling of metals; it includes the properties and theoretical aspects of metals as well.

Chapter headings, which will give the reader an idea of the scope of this work, include: general properties of metals and alloys; their constitution, casting, working and heat treatment; mechanical properties and mechanical testing; copper, aluminum, nickel and their alloys; miscellaneous non-ferrous mixtures.

The last chapter is on the choice and specification of a non-ferrous alloy. The average reader would wish that this chapter had been longer and had included a great many more uses, or at least, more detailed uses. As a matter of fact, a table, with no limit as to length, giving all possible uses for non-ferrous metals and specifying the best to use under these circumstances would have been welcomed. Nevertheless, the book is unusually useful and worth having.

The Chemical Resistance of Engineering Materials. By Hamlin and Turner. Published by the Chemical Catalogue Company. Size 6 x 9, 267 pages. Price payable in advance, $5.00. For sale by THE METAL INDUSTRY.

This work is of considerable interest to those engaged in non-ferrous metals which go into the chemical industry. In the introduction the class of materials and the destructive reactions, the influence of agitation and the influencing of electrolytic action, are discussed. In later chapters acids are taken up in order and their effect upon the metals considered. These acids are sulphuric, nitric, hydrochloric, other halogen acids, selenic, acetic, butyric, formic, jalmitic, stearic, oleic, oxalic, tartaric, citric malic, lactic, picric and carbonic. Also atmospheric corrosion and the various types of protection are included.

The bases and alkaline salts and also neutral substances are taken up and their effect upon the metals described. Recommendations are made for the selection of material for specific equipment and a very interesting table appended covering the materials for evaporators, centrifugal pumps and reciprocating pumps.

GOVERNMENT PUBLICATIONS

Platinum and Allied Metals in 1922. By James M. Hill, U. S. Geological Survey, Washington, D. C.

Tin in 1922. By Bertrand Leroy Johnson, U. S. Geological Survey, Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating Chemical; R. E. SEARCH, Exchange-Research }

BATTERY PLATES

Q.—I am interested in smelting of battery plates but I am unable to find any literature treating the smelting process of battery plates from practical standpoint.

A.—Battery plate material must be handled in reverberatory or blast furnaces. The first operation would be to recover as much metallic lead as possible by liquation, that is by heating the charge on an inclined hearth until the metal melts and runs out of the furnace. The residue consisting of lead oxide and sulphate should be smelted with iron in a blast furnace or an open hearth furnace similar to the one used for melting steel.—W. J. R. Problem 3,257.

BRIGHTENING ALUMINUM

Q.—In casting a number of aluminum parts the castings were left standing in the sand too long resulting in a dark color on the surface of the castings when they were shaken out. As it is desirable to bring back the light color, we are writing to you for information as to the proper operation to effect this. We understand there is some chemical action that will bring the light color to aluminum but we are unfamiliar with it.

A.—The only way I know of to bring back the color after they turn black in the mold is to dip them. However, aluminum cannot be bright dipped the same as brass. The acids have no effect upon the aluminum to reduce any oxide that may form on the surface. The usual way of whitening aluminum consists of cleaning from oil and grease in benzine and gasoline and then immersing for a few minutes in a hot solution of 5% to 10% caustic potash. The castings are then washed and immersed in aluminum dipping baskets in yellow aquafortis (38 degrees), then washed and dried in maple sawdust. This is the usual method followed by manufacturers of aluminum goods.—W. J. R. Problem 3,258.

BROWN ON BRASS

Q.—How can I get a brown or brass like the enclosed sample?

A.—We do not believe that you can produce a finish similar to your sample directly upon the brass. We have rubbed the unfinished side of the sample lightly with a piece of steel to remove the oxide, and the indications are that the sample was very lightly copper-plated previous to oxidizing to obtain the color.

We advise you to try the following:

In one quart of boiling water dissolve four ounces of sulphide of barium. The solution should be cooled down to normal and bottled as a stock solution. Copper plate the brass articles to receive the finish in a copper cyanide solution for two or three minutes. Then wash in water and immerse in the following solution:

Water, 1 gallon temp. 160 to 180 deg.

Sulphide of barium stock solution just sufficient to give a brownish black appearance to the copper. As soon as this color is produced remove the articles, wash and dry them.

Scratch-brush dry by the aid of a worn brass wire scratch-brush. Finally lacquer the articles. We believe these suggestions will give the finish on your sample.—C. H. P. Problem 3,259.

BRUSH BRASS COMPOSITION

Q.—What is the composition used on tampico wheel to obtain a brush brass finish on brass goods which leave the work dry and clean so that it can be lacquered directly after finishing?

A.—We have inquired throughout the trade, but have been unable to find anyone who knows of a composition which can be used on a tampico wheel to obtain a brush brass finish which would leave the work clean and dry, so that lacquer can be applied to it without some cleaning process between the two operations. The reason for this is that all brush brass compositions are mixed with some form of grease and lacquer will not adhere to a greasy surface.

There is another process of using a tampico wheel to get a brush brass finish, and this consists in brushing over the article with powdered pumice stone, grade No. 1, the pumice stone to be mixed with water, but this process also requires some washing after the brushing process.—C. H. P. Problem 3,260.

BRUSH FINISH

Q.—We are enclosing an article that we expect to plate in a Butler silver and an oxidized silver. It will be a cheap job that must be handled quickly. Can you suggest any method or solutions that might help us in this matter, other than the usual method? The article will be dip lacquered when finished.

A.—Your sample is a brush finish. Apparently the brushing was done by hand. It is too even a finish for a mechanical brush finish. Passibly you could arrange to silver plate the articles, made up similar to your sample, if of brass, by mechanical plating. Preferably by the aid of the oblique type of plating barrel, in which the anode is suspended by a rod into the barrel in close contact with the articles to be plated. It would be necessary to use a thin film of mercury, so that a positive adherence of the silver would result. An addition of cadimium or nickel cyanide would help to harden up the silver deposit, and you could therefore deposit less metal than if you were depositing pure silver.

After plating you might be able to produce the brush finish by tumbling the articles in a similar type of barrel, using hardwood sawdust and pumice stone as the brushing medium. You could possibly try the method, both dry and wet.

For the oxidized finish, a solution of either polysulphide or lead acetate and hyposulphite of soda can be used. The latter method would give you a gray black. The deposit, however, would be soft, would not attack the silver and would remove easily.

Try the following formula:

Water	1 gallon 180 deg. Fahr.
Hyposulphite of soda	6 ounces
Lead acetate	3 "

To remove the polysulphide or lead-acetate black, try tumbling in the sawdust and pumice stone.

Novelty manufacturers use a brass ball similar in shape to steel balls to tumble the black off. Brass is softer and gives a duller finish.—C. H. P. Problem 3,261.

BURNISHING WIRE

Q. We manufacture gut wound strings, pure silver round wire, .990 fine being used for the purpose, gauge of wire being .005. Now what we wish to do is to polish the string after it is wound with the round wire so that it will have the appearance of a flat burnished surface as shown on string marked polished. This polishing must be done in a way that will not injure the string by heating unnecessarily. The string is on a machine, the spindles holding the string out tight, revolving about 4,000 revolutions per minute. We have used sandpaper, emery cloth, carborundum stones and other appliances but cannot seem to get the right surface and still get production. The production necessary for a day's work is one gross of strings. We get only four dozen.

Can you suggest some way that the round wire can be polished to give the flat burnished effect and at the same time get production, without burning the wire or injuring the string by overheating. The string after being finished must not show any scratch marks, or where the wire is wound on, but must be smooth and polished.

A.—If the strings that you cover with pure silver wire (.005) were drawn through a diamond die, such as they use in drawing fine silver wire to .005, the drawing through the die would burnish the wire and slightly flatten it, due to elongation.

It would be necessary to have the die just a mere trifle smaller than the diameter of your strings.

If just a minute amount of the following solution—

Water ..... 1 gallon
Castile soap powder ..... 2 to 4 ounces

were applied to the strings the solution would act as a burnishing and drawing medium. It would seem to us that the strings could be readily drawn through the diamond die by hand. Agate dies could be used just as well as diamond dies.—C. H. P. Problem 3,262.

CASTING ANTIMONIAL LEAD

Q.—We are sending samples of cast metal taps showing spotting which bothers us in many of our castings. The spotting only appears after they are turned on a lathe by a forming tool. The metal is lead 87%, antimony 13%; cast in iron molds, single, 200 lb., open pot, average temperature 700 to 750 F., but have to give quite a wide range of temperature. We think temperature and the human element enters into the trouble and we would like to know if you could tell us anything that could be added to the metal to lessen this shrinkage.

A.—We received the sample castings and on examination we are inclined to believe your troubles are due to shrinkage or segregation of the metal. Your mixture of 87 lead and 13 antimony are the proportions that are called the eutectic of the two metals, and give the minimum amount of trouble in castings.

Shrinkage and segregation are overcome by using new metal to form the alloy. If scrap is used there is no telling where the trouble lies. Half of the lead should be melted and all the antimony in separate containers. It is preferable to melt the antimony in crucible and when the lead is melted to a red heat, pour the molten antimony into the lead, stir well and pole the alloy with a green pole. After adding a handful of sal ammoniac, pour into ingots and look at the fracture. If the metal is alloyed properly you will have a close fine grain free from shrinkage and segregation. These ingots should be remelted for castings such as you are making and poured at as low a heat as it is possible to produce good castings. Use a pyrometer to maintain what temperature you have found best for your work.—W. J. R., Problem 3,263.

CASTING NICKEL

Q.—What is the best way to produce pure nickel castings?

A.—Nickel does not cast well as it absorbs gas (CO) which is given out on cooling, causing holes in the castings. This difficulty is overcome by the addition of a small quantity of magnesium; the amount is said to be about ⅛ per cent. It has the same effect that aluminum has on steel. Castings can be made from pure nickel with ⅛ per cent of magnesium as a deoxidizer, but it is very difficult to cast copper and nickel alloy in all proportions, as the color does not change until less than 75% nickel is used. Monel metal is used in most places where nickel castings are desired, unless they are wanted for nickel anodes, then 95% nickel is used and 5% iron, which casts well for that class of work.

The statement that for anodes, 95% nickel and 5% iron casts well in that class of work, does not mean that pure nickel anodes cannot be obtained. It is the practice of some manufacturers to add from 1% to 5% iron to the nickel when used for anode work to aid the casting qualities. When pure nickel is desired, sheet or forged nickel is sometimes used on account of the difficulty in casting in sand. However, pure nickel can be cast in sand with the proper method of deoxidation of the molten nickel, which is to use magnesium ⅛%. This will insure perfect castings.

Monel metal melts at a temperature a little higher than cast iron, say 2480° F. When the proper temperature is obtained, the crucible is taken from the furnace and 1½ ounces of magnesium to every 100 lbs. of melted metal ore placed in a pair of tongs and pushed to the bottom of the crucibles as quickly as possible. Castings are gated on the same general plan as casting manganese bronze. The sand should be of a nature to stand this heat and be free from oxide of iron.—W. J. R. Problem 3,264.

COLORED BRASS BEADS

Q.—We are anxious to find out how the enclosed beads are finished. These goods are made in various colors such as jade, lavender, orchid, pink, etc. They are very beautiful light shades.

A.—We are of the opinion that the beads in the sample necklace submitted to us are finished by a combination of spray and tumbling methods.

An oblique tumbling barrel should be used. On the inside of the tumbling barrel, spaced equal distances apart, should be secured four drains about two inches across. These should be made from steel, shaped like gutters used to carry the water to the leaders on house roofs, etc.

These drains or gutters should be placed on an angle and should reach to within six or eight inches of the bottom of the barrel. The reason for these drains or gutters is that, when the beads are being colored by the tumbling method, using a regular lacquer spray to apply these drains well pick up the beads continually and keep them separated, so that the colors may be applied evenly. This same method is used in japanning small articles in black and various colors.

These beads are made of high brass. They should be cleansed thoroughly and preferably lacquered. The lacquer will act as a size for the japans or enamels. We are not positive as to the colors used. They may be either lacquer, enamel or japan colors. The latter are used to a great extent in the production of the well-known polychrome finish, the colors of which are used in endless variety.

It may be necessary to dry the colors when applied by heat from 200 to 300 deg. Fahr. The beads should, however, be partly dry so that they will not stick in drying, before they leave the tumbling barrel.—C. H. P. Problem 3,265.

ALUMINUM IN COMPOSITION BRASS

Q.—We shipped you today, express prepaid a casting of the following composition:

Copper, 85; lead, 5; zinc, 5; tin, 5.

Can you tell us the cause of these defects and how to correct them? We have an oil fired tilting crucible furnace, use a charcoal and hydrated lime cover and common salt as a flux.

A.—Your sample casting has the appearance of aluminum in the metal. I suggest you have an analysis made for aluminum. Where lead is present in the mixture to the amount of 1% or over and even a very slight amount of aluminum gets in your mixture, the condition similar to your casting is the result. With a mixture of 85% copper, 5% lead, 5% zinc and 5% tin, and the flux you are using, no trouble making such a casting as the sample furnished should be experienced.

It may be possible you may have melted in this same furnace a mixture containing aluminum and in this manner the aluminum is taken up by your mixture of 85-5-5-5. At any rate your sample casting shows that aluminum has gotten into your mixture in some manner and we suggest you investigate this point, and keep aluminum out of any mixture containing lead.—W. J. R. Problem 3,266.

SILVER SOLDER SUBSTITUTE

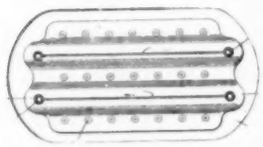
Q.—We use silver solder to braze the joints on the enclosed nickel silver rod mounting. This method we find is very good, but it is too expensive. Can you suggest a brazing compound or some other hard solder that will not appear too yellow, and will not blow away when the torch is applied?

A.—The composition of silver solders varies considerably according to the nature of the work. Solders for nickel silver are generally made of the same materials as those which compose the alloy to be soldered but in such proportions that the melting point is lower. A silver solder extensively used contains 70 parts silver and 30 parts copper. A solder that is not expensive and would be suitable for your work is composed of copper 47 parts; nickel 88 parts; zinc 42 parts. —P. W. B. Problem 3,267.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,467,083. September 4, 1923. **Electroplating Anode.** Blasius Bart, East Orange, N. J., assignor to Swiss Anode Corporation, a Corporation of New York.

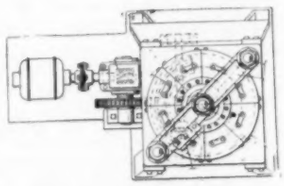


An anode comprising a body of active metal and a securing and reinforcing bar of inert metal adapted to hold said body together in the event of unequal consumption of the active metal resulting in the complete dissolution and disintegration of portions of said active metal.

1,467,398. September 11, 1923. **Process of Coating.** Earl E. Schumacher, East Orange, N. J., assignor to Western Electric Company, Inc., New York.

A process of coating which comprises dipping a base metal core to be coated in a molten bath of alkaline earth hydroxide.

1,467,490. September 11, 1923. **Casting Machine.** Paul E. Norris, Swissvale, Pa., assignor to Willard Storage Battery Company, Cleveland, Ohio.

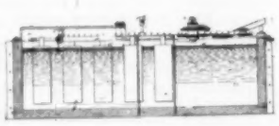


In a casting machine, a rotary horizontal casting table composed of a plurality of separate or independent fixed mold blocks having mold cavities and having a continuous flat surface and provided on the lower sides thereof with vertically movable ejectors, each ejector and its mold block constituting a unit which may be applied to or removed from the machine, and means controlled by the movement of the table for elevating the ejectors to lift the castings from the mold cavities.

1,467,574. September 11, 1923. **Tray for Use in Conjunction with the Chemical Cleansing of Silver.** Raoul Alfred Faralla, New York, assignor, by mesne assignments, of one-half to Carl Kraft and one-half to Oscar Mautner, both of New York.

A combination supportive tray and electrolyte terminal, for use in the electro-chemical cleansing of silver, which tray is composed of a main base consisting of two parts, movable relative to each other and of limited travel, which main base has two side supporting walls for securely retaining the contents of the tray and for increasing the resistance of the main base to bending, the corners of said main base being so bent as to elevate the main base plane above the resting plane of the tray.

1,468,764. September 25, 1923. **Electroplating Apparatus.** Van Winkle Todd, Milburn, N. J., assignor to the Hanson & Van Winkle Company, Newark, N. J.



In an electroplating machine the combination of a channel shaped cathode bar upon the vertical flanges of which work may be slidably supported, and a conveying means in said channel adapted to engage with work hung upon the flanges of the channel to effect a longitudinal movement of said work along and in contact with said bar.

1,468,828. September 25, 1923. **Alloy.** Otto Najacht, Chicago, Ill.

An alloy consisting of copper, 3 pounds; aluminum, 1½ ounces; and the constituents of ordinary brass to the amount of .8 ounces.

1,468,407. September 18, 1923. **Alloy.** Arnold Schroetter, New York, assignor to American White Gold Manufacturing Company, New York.

An intermediate alloy for the production of a white metal, said intermediate alloy containing approximately 95% of nickel, 2½% of gold, and sufficient zinc, magnesium and antimony to produce a definite influence on the finished product, the said sum of zinc, magnesium and antimony totalling less than 2%.

1,468,944. September 25, 1923. **Charging Apparatus for Enameling Furnaces.** William Hogenson, Chicago, Ill., assignor to Chicago Vitreous Enamel Product Company, Chicago, Ill.

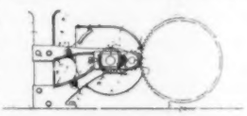
Charging apparatus for enameling furnaces, comprising in combination, a carriage having a removable work carrier, a furnace charging fork, arranged to receive said work carrier when the latter is moved over said charging fork, tracks, for supporting one end of the fork, and depressible rollers for supporting the other end of the fork.

1,469,191. September 25, 1923. **Gold Solder.** William Sheff and Henry Wm. Sheff, Brooklyn, N. Y.

A composition of matter for use as a solder for gold, which comprises gold approximately 60%, nickel approximately 7%, zinc approximately 16%, and copper approximately 15%.

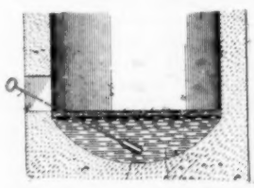
1,469,341. October 2, 1923. **Bronzing Machine.** Richard J. Spencer, Chattanooga, Tenn.

A bronzing attachment for cylinder presses comprising an elongated casing provided with means for attachment to the frame of a cylinder press, said casing being cylindrical throughout the major portion of its cross sectional configuration but having one upper corner formed rectangular, a cover for said rectangular corner, a curved partition within the casing at said rectangular corner to define a compartment for the storage of bronzing powder.



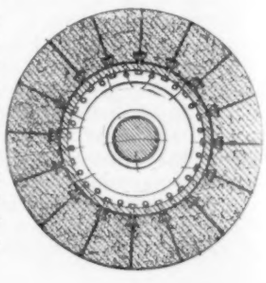
1,469,706. October 2, 1923. **Method of Treating Molten Metals.** Calvin Vos, New York.

The method herein described of treating molten metal with suitable alloys within a furnace, consisting in forming the alloys into a cylindrical body with a central tapered opening therein, fixedly wedging a suitable tool in said opening, submerging said alloy into the molten metal below the surface of the metal and supporting it therein by means of said tool until the alloy is entirely dissolved, and finally withdrawing the tool from the furnace.



1,469,723. October 2, 1923. **Segmental Abrasive Wheel.** Wallace W. Greenwood, Worcester, Mass., assignor to Norton Company, Worcester, Mass.

A grinding wheel comprising a cylindrical drum adapted to be mounted concentrically on the wheel spindle, abrasive segments mounted thereon and forming a cylindrical grinding surface, each of said segments having a projecting lug on an inner portion, and clamping means including a removable wedge to engage said lug with adjustable pressure and replaceably fasten the segment to said drum.



EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW DIE CASTING MACHINE

Die-castings are made of alloys having a base of either zinc, tin, lead or aluminum, and running as high as 35,000 pounds per square inch in tensile strength. The castings are made in steel moulds under varying pressures running as high as 400 pounds per square inch and are taken from the die-cast accurately, to .001", with smooth and uniform surfaces.

The die-casting industry which has been developed in the United States in the last twenty years represents one of the greatest labor saving processes used in mechanical production. There are about 50 manufacturers who specialize in this field and whose product today will total in the neighborhood of $30,000,000. About ten years ago the total outfit did not exceed $5,000,000.

Today, very few manufacturers make their own die-castings, largely because each die-casting company has developed its own machines and processes and no one has made a business of selling die-casting machines and equipment to the trade. For the same reason, and because the development of an efficient die-casting machine is an expensive and hazardous undertaking, only a few of the die-casting manufacturers have the most modern, efficient high producing machines. There has been a policy of secrecy in the trade; each one fearing that his competitors will find it to his advantage to copy his equipment or methods, with the result that the development of the trade as a whole has been retarded.

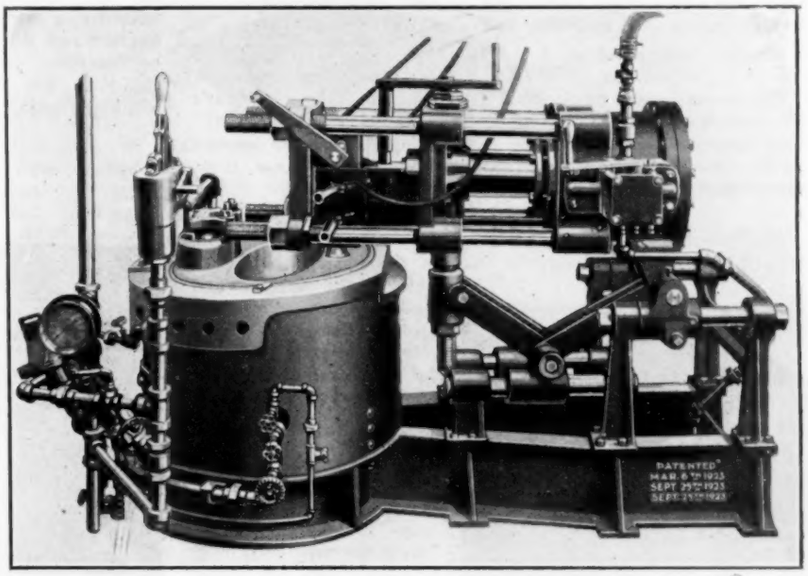
In the last few years there has been a steady growing demand for die-casting equipment by large users and producers, both here and abroad. The type of machine which will supply this demand must be simple to operate, fool-proof, and capable of high production.

A machine has been developed during the last five years by Edgar N. Dollin, 6 Church street, New York, and a number of these machines are in operation both here and in England. They are said to have proved themselves exceptionally high producing machines, running well over 200 operations per hour on many long run jobs and that almost any intelligent workman can operate them, as they are fool-proof and absolutely safe. Advantages claimed are that they are interchangeable as to alloys; they will cast aluminum with high efficiency and may be changed over to the zinc, tin and lead alloys with equal efficiency; they remove all the hard manual work of the operator, opening and closing the dies and shooting the metal entirely by power. In addition they have ample power to pull cores and slides. The machines are sturdy and strong in design and are operated entirely by two valves.

The method of heat regulation has, it is stated, been improved making it absolutely reliable, and the alloys are handled in such a manner that deterioration by heat and absorption of iron is reduced to a minimum. The up-keep is low, and they use very little power, a new patented method of using compressed air being employed.

Edgar N. Dollin, the designer of the machine, has had many years of experience with the leading companies in the die-casting field. He was formerly secretary of the Doehler Die-Casting Company from which company he resigned to organize and become president of the Acme Die-Casting Corporation. The latter company was absorbed by the Aluminum Die-Casting Company, Mr. Dollin selling his holdings to undertake the reorganization of the Precision Casting Company. This work was recently completed. During the reorganization work he installed a die-casting plant in England which is operating successfully.

Mr. Dollin is now manufacturing and selling die-casting machines, offering with the machines a complete engineering service so that those who install machines will have the benefit of all the latest developments of the art.



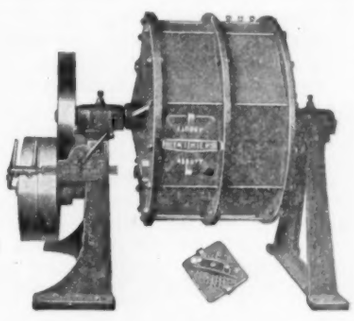
DIE-CASTING MACHINE IN CLOSED POSITION

NEW BURNISHING BARREL FEATURE

The Abbott Ball Company of Hartford, Conn., has added some important features to burnishing and cutting down barrels by equipping all of the barrels with gear guards and a very unique belt shifter. This will be standard equipment on all orders in the future.

The Abbott Company is also prepared to furnish a strainer cover so designed that it makes very easy work to wash out the barrels. This strainer cover is cast with a number of half-inch holes in it, and is fitted on the inside with a piece of wire cloth of the proper mesh so as not to allow even the smallest balls now used, to go through. This strainer cover is used in place of the regular cover when rinsing out or draining the liquid from the barrel.

This cover is shown in the illustration below the barrel.



NEW ABBOTT BARREL EQUIPMENT

CIRCUIT BREAKERS

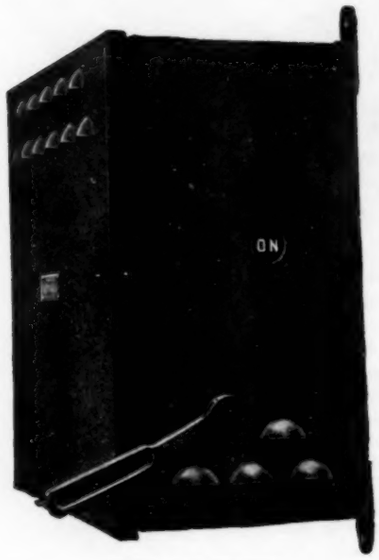
Roller-Smith "Safety" circuit breakers made by the Roller-Smith Company, 233 Broadway, New York, are of two types, "P" and "E." The Type "P" circuit breaker, as shown in the illustration was designed primarily for use in industrial plants on circuits of 250 volts or less, D. C., and 550 volts or less, A. C. They are equipped with strong and simple non-closable-on-overload mechanism. Through the medium of this device it is absolutely impossible to close the breaker or to hold it closed while an overload exists. This means that the tying down of the handle and other dangerous expedients, often resorted to by indifferent or ignorant operators, will be rendered harmless. If the cover of the box is locked or sealed, the circuit controlled can have applied to it only the current for which the breaker is set, regardless of the desires of the operator. Type "P" circuit breakers are fully enclosed. They are supplied as two, three or four pole devices, up to and including 200 amperes, and also with various styles of trips.

OPERATION

Pull down handle to close. Push up handle to open. That's all there is to it. A conspicuous target shows "Off" or "On." This target is located on the right side, but can be located on the left side or on the front, without extra charge, if so specified.

METHOD OF MOUNTING

The breaker may be mounted on a wall or frame, four metal ears projecting from the back of the box, providing an extremely simple and rugged method of support. Knockout holes for conduit are provided at both the top and bottom, and there is a sufficient number to allow the cables to be led in at the bottom and out at the top, or both in and out of the top or bottom. The method of attaching cables is extremely simple: after the box is mounted on the wall or frame and the conduit attached to the breaker box, the cables may be pulled into the box, the terminals slipped over their respective studs, and the job is done. The breakers never need be taken out of the box during the process of mounting.



TYPE P. BREAKER

OTHER FEATURES

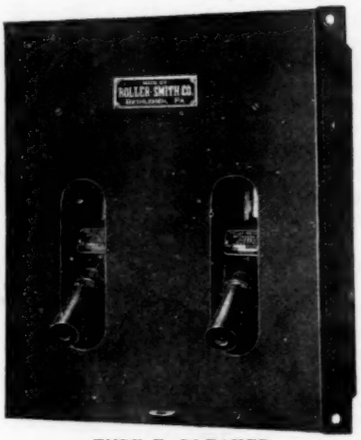
In addition to the regular overload protection, all Type "P" breakers are equipped with under-voltage trip. When it is used for the protection of induction type polyphase motors, it is usually desirable to include time limit features, whose action will prevent the initial surge of current from opening the breaker. Type "P" breakers are supplied with time limit attachments, when so ordered.

GROUP MOUNTING

A very compact and economically built distributing board may be obtained by mounting a number of "P" breakers closely together on a simple angle iron frame. This arrangement gives an absolutely safe board, allows of ready expansion, and does away with the need of obtaining and drilling any slate panels. If desired, the breakers can be mounted within two inches of each other, thus keeping the size of the board down to a minimum. When desired, the breakers can be furnished at standard prices, with studs projecting from the back for connections. This arrangement is desirable when mounting the breakers closely together.

TYPE "E" BREAKERS

Roller-Smith Type "E" circuit breakers differ from the Type "P", described in the preceding pages, chiefly in the fact that the Type "P" circuit breakers are of the "free handle" type, whereas the Type "E" circuit breakers are not. The two pole, independent arm Type "E" circuit breakers are so arranged that when one pole is closed and then the other, the pole first closed will open instantly if an overload exists at the time.



TYPE E. BREAKER

Type "E" circuit breakers are recommended for all applications where a lower priced enclosed device is wanted and where the "free handle" Type "P" circuit breaker is not required. The various listings cover a wide range of requirements.

OPERATION

Pull down handle to close. Push up handle to open. The position of the handle indicates whether the breaker is open or closed. On all Type "E" breakers, except the two pole, independent arm one, a single handle projects through a slot in the front cover.

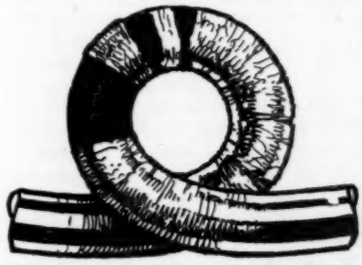
The method of mounting is the same as for Type "E".

ZINC COATED WIRE*

The Keystone Steel and Wire Company of Peoria, Illinois, announces that it has solved a problem in wire making which has puzzled experts for thirty years. The new process, which is named "Galvannealing," and which is not to be confused with "galvanizing," gives the wire longer protection against rust.

Almost everyone is familiar with the fact that steel of all kinds rusts quickly unless covered with zinc or some other substance that protects the surface of the steel from the air.

Ordinary wire, especially the kind used in making articles which are used out doors, such as wire rope, telephone wire, clothes lines, wire fence, etc., commences to rust just as soon as the zinc coating wears off. Rusty wire breaks quickly and soon becomes useless, so the big problem has always been "how to get more zinc protection on the wire." By the ordinary process the wire is first cleaned, then submerged in or drawn through molten zinc, then wiped smooth by asbestos wipers. This produces a good rust resisting grade of wire while the thin coating of zinc lasts, but it has never before been possible to leave very much zinc on the wire used for manufacturing purposes, such as fence, barb wire and other articles that must be handled by machinery, because it cracks, chips or scales off when too thickly applied. This fact accounts for the short life of all wire products made by the ordinary method.



ORDINARY GALVANIZED WIRE CROCKS, CHIPS, AND SCALES WHEN SHARPLY BENT

* From the Bulletin of the American Zinc Institute, September, 1923.

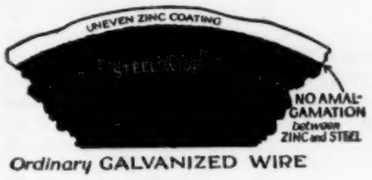
The main reason why wire made the ordinary way does not stand bending, unless the zinc is very thinly applied, is because the zinc coating is not amalgamated with the steel. In other words, it flakes off like hard enamel would if applied to wire, when the wire is sharply bent. This exposes the surface of the wire to rust quickly. One of the deplorable features of the ordinary process is the fact that the more zincing the maker puts on the wire, the more easily it cracks or scales off while being made into wire products of all kinds.

"GALVANNEALED" WIRE PRESENTS A HARD, CLEAN SURFACE UNAFFECTED BY SHARP BENDING

By this new process the zinc is said to penetrate the steel or amalgamate with the wire. It is claimed that the zinc can be applied so much more thickly the new way that it lasts much longer, and it is practically impossible to break through or peel off this new process of coating of zinc.

This new method of "Galvannealing" (zinc coating) wire differs from the old process of applying the zinc in that, instead of wiping off the zinc when the wires emerge from the pans, they are passed through a long "heat-treating" furnace, which keeps the heavy zinc coating in a molten state long enough to allow it to spread out evenly over the surface of the steel wire and, it is said, to penetrate it until it becomes so much a part of the wire that it is impossible to separate one from the other. The heat in this "heat-treating" furnace is a bright cherry red.

"Galvannealed" or "Triple-Life" wire will also be used in making barbed wire, clothes lines, brace wire, gates and other fencing products which require wire to produce. It is said to withstand at least four (usually more) one minute immersions in sulphate of copper solution. "Galvanized" wire ordinarily withstands not more than two (usually less). This copper sulphate test is the well known Preece test. It is made by dipping the wire in a sulphate of copper solution, at a given strength, one minute, then rubbing it off and dipping it in for another minute and again rubbing it off and so on until the zinc is removed. As soon as the zinc is removed from any part of the wire, that part of the wire will begin to show copper color.



The processes were patented by J. L. Herman, Superintendent of the Company's Wire Mills, the licensor being the Keystone Steel and Wire Company.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTROCHEMICAL SOCIETY

Headquarters, Columbia University, New York City

Many past meetings of the Society have brought forth both valuable and interesting information, but there are few that can compare with the success of the Dayton Meeting. In addition to an exceptionally well prepared technical program there were opportunities to make visits to industrial plants of particular interest to members of the Society. Recreation facilities were not lacking; the Miami Valley Country Club was the scene of the golf tournament where T. F. Baily and R. W. Milnes exhibited skill which won each a silver trophy.

Following the technical session held on Thursday morning, at the Hotel Miami, the meeting adjourned to the Engineers' Club where four Round Table Meetings were held at luncheon for the purpose of informally discussing the following topics:

I.—Electric Furnace Brass Foundry Practice. (H. W. Gillett, presiding.)

II.—Electrodeposition. (Walter Fraine, presiding.)

III.—Organic Electrochemistry. (C. J. Thatcher, presiding.)

IV.—Utilization of Chlorine. (A. H. Hooker, presiding.)

These group luncheons were an innovation and it was readily conceived that an unusual amount of interest was prevalent at each Round Table for by three o'clock, the time scheduled to leave for McCook Field, the discussion was still under way.

The inspection of the Air Service Engineering Division of McCook Field gave the members and guests of the Society an excellent idea of the investigations which are continually being made with the object of improving and perfecting aircraft. The following sections were visited: Chemical laboratories, Comouflage, Fabric testing, Wood testing, Metallurgical laboratory, Wings and fuselage unit, Pattern and model unit, Machine shop, Metal shop, Power plant laboratory, and Hangars.

At about 5 o'clock the trip was continued to the Miami Conservancy where the Englewood dam on the Stillwater River was inspected. In all there are five such dams above Dayton which serve to protect Dayton and the towns farther south against any possibilities of a flood.

Having arrived at Triangle Park, a dinner and smoker lent enjoyment to everyone. President Hinckley was toastmaster and the entertainment which followed included music, talks by F. A. Lidbury on the "Electrochemistry of Golf," and E. F. Northrup on the "Electrochemistry of Dogs." The main feature of the evening, however, was the address by Chas. F. Kettering, head of the General Motors Research Corp. Mr. Kettering is internationally known as one of the outstanding research engineers of this age. His address was very inspiring and was received with a great deal of enthusiasm. The remainder of the evening was given over to moving pictures of various activities at McCook Field.

On Friday morning and afternoon a symposium on "Electrochemistry of Gaseous Conduction" took place. Dr. Duncan MacRae, who was primarily responsible for this symposium, presided. During the afternoon small groups of members made visits to the following plants: American Rolling Mill Company, Delco, Delco Light, Duriron Company, General Motors Research Corp., and National Cash Register Company.

Friday evening a demonstration of the Sperry search light preceded the illustrated lecture by Dr. H. B. Wahlin, of the University of Wisconsin, on "Gaseous Conduction."

The last technical session was held Saturday morning, when various papers on Electrodeposition and Electroplating were presented and discussed.

In conclusion we wish to say that the untiring efforts of H. M. Williams, E. H. Kramer, R. H. Hagerman, and other members of the local Committee were largely responsible for the success of the Meeting.

BELLEVUE-STRATFORD HEADQUARTERS FOR SPRING MEETING AT PHILADELPHIA

The Forty-fifth Meeting will be held in Philadelphia, Pa., April 24, 25 and 26, 1924, with the Bellevue-Stratford as headquarters.

The symposium on "Recent progress in Electrodeposition," which is in course of preparation by S. Skowronski, Research Chemist, Raritan Copper Works, Perth Amboy, N. J., has been outlined to include the following:

Electro-Refining of Metals (soluble anodes). Copper, zinc, nickel, tin, lead, bismuth, silver, gold and antimony.

Electro-Winning of Metals (insoluble anodes). Copper zinc, antimony, silver, gold, palladium and iron.

Electro-Forming of Metals (galvano-plastic). Copper, nickel and iron.

Electro-Plating of Metals. Copper, silver, gold, nickel, tin, lead, zinc, Chromium and iron.

The favorable replies received indicate that each of the above groups will be represented by contributions from many noted authorities.

There will be a group of papers on "Electric Furnaces" which will be followed by a Round Table Discussion. This session will be in charge of the Electrothermic Division.

SOCIETY TO MEET IN DETROIT IN FALL, 1924

At the Dayton Meeting of the Society, Mr. E. L. Crosby, of the Detroit Electric Furnace Co., formally invited the Society to meet in Detroit in September of 1924. The invitation was enthusiastically received. The subjects for discussion at that time will include "Electric Furnace Refractories" and "Corrosion Problems."

AMERICAN ELECTRO PLATERS' SOCIETY

PHILADELPHIA BRANCH

Headquarters, care of Philip Uhl, 2432 N. 29th St.

The Annual Banquet of the Philadelphia Branch will be held on Saturday evening, November 24, 1923.

The banquet will be held in Mossbach's Hall, Girard Avenue and 13 Street. There will be an afternoon session for the reading and discussion of papers at 3:30 p. m. After the banquet there will be dancing and the committee promises some surprises for the ladies.

For information, tickets, etc., write to George Gehling, 5001 Edmund Street, Philadelphia, Pa.

BRITISH INSTITUTE OF METALS

Headquarters, 36 Victoria Street, London, England

The Institute of Metals has just issued its programme of meetings and lectures for the Session 1923-24. There are over thirty lectures and addresses to be given before the Institute's local sections in Birmingham, Glasgow, London, Newcastle-on-Tyne, Sheffield and Swansea, as well as at meetings of the parent Institute, one of the latter including a lecture by Dr. F. W. Aston, F. R. S., which is to form part of the proceedings of next year's Empire Congress of Mining and Metallurgy.

The subjects of the lectures are of a character to interest engineers and metal workers, and include "Extrusion Problems," "Nickel Brasses," "Some Impressions of American Non-Ferrous Metallurgy," "Metals for Lamp Manufacture," "X-Rays and Metallurgy," "General Scientific Brass Foundry Work," "Alloys for Use with Superheated Steam," "The Density of Alloys," "The Annealing of Non-Ferrous Metals," "The Action of Molten Brass on Nickel Steel," "Propeller Brass," "Large Metallic Crystals and Some of Their Properties," "The Cold Working of Metals," "Electric Resistance Furnaces," "Substitutes for Platinum," "The Metallurgical Microscope," and "Influence of Casting Temperature on the Physical Properties of Metals."

W. M. Corse, National Research Council, 1701, Massachusetts avenue, Washington, D. C., is the honorary corresponding member to the Council for the United States.

It is thought by the Council that Members resident in the United States would be interested to know of this appointment as it is intended that Mr. Corse should act as a means of communication between the American members and the Council in any matters that the members may wish to be brought to the notice of the Council.

The Council is always willing to receive—through their honorary corresponding member—and to consider, offers of papers by American members.

STERLING SILVERWARE MANUFACTURERS

At a meeting held at Bridgeport, Conn., October 9, 1923, at which the following manufacturers (who produce 90% of the Sterling silverwares made in the United States and Canada) were represented, it was the unanimous opinion that none of the tarnish resisting alloys investigated are sufficiently perfected to warrant their introduction or adoption by the trade.

This conclusion was reached after having carefully investigated the tarnish resisting and other qualities of the so-called "Tarnish Resisting Sterling Silver," as furnished by English manufacturers and the several alloys produced by Handy & Harman and other American manufacturers.

The experiments made demonstrated that these new sterling alloys not only failed to give the results that had been anticipated from tarnish resisting Sterling silver, but in many important features compared unfavorably with the regular Sterling alloy in use for several centuries.

Experiments will continue both in the silver trade and scientific circles and should they eventually produce a real non-tarnishing sterling alloy, the manufacturers will at that time give full consideration to its merits.

It was also suggested at this meeting that serious thought and attention be given to the treatment of regular Sterling silverwares to the end that they may resist tarnishing.

Alvin Silver Company, Henry Birks & Sons, Ltd., Montreal, Que.; Dominick & Haff, Wm. B. Durgin Company, J. F. Fradley & Company, Graff, Washbourne & Dunn; Gorham Company, Handy & Harman, G. A. Henckel & Company, International Silver Company, The Wm. B. Kerr & Company, La Pierre Mfg. Company, The McChesney Company, The Matthews Company, Inc.; Reed & Barton, Redlich & Company, Roden Bros., Ltd., Toronto, Ont.; Rogers, Lunt & Bowlen Company; Frank W. Smith Company, Tiffany & Company, Towle Mfg. Company, R. Wallace & Sons Mfg. Company, Webster Company, Frank M. Whiting & Company, Whiting Manufacturing Company.

SILVER PRODUCERS ASSOCIATION

In the announcement, October 22, 1923, in the daily press that the Silver Producers Association had been formed with an executive personnel embracing twelve of the largest silver producing companies in this country, the financial community saw the first step in an attempt on the part of American interests to cause the transfer of the world's premier silver market from London to New York.

With the object of establishing improved agencies for the sales and distribution of American silver production the association has been organized with a charter membership representing more than two-thirds of the world's silver output which is taken from mines in this country.

The Silver Producers Association will be headed by C. F. Kelley, president of the Anaconda Copper Mining Company of New York.

SILVER EXPORT ASSOCIATION

Plans for organization of the proposed Silver Export Association will be formulated at a meeting in New York on November 15 of a committee of fifteen representative companies operating in the United States, Canada, Mexico and South America. The meeting will be held in the Waldorf-Astoria.

The association will, it is planned, closely resemble the Copper Export Association in its activities. With the ending of silver buying for the United States Mint under the Pittman act, the price of the metal has dropped sharply and producers have been placed under the burden of unprofitable operation. They intend to remedy this condition through the concerted development of foreign and domestic markets for silver and through enlargement of the purposes for which silver is now used.

Instead of depending upon silver purchases for Government Mint requirements, it is now planned to bring silver into wider use commercially.—New York Times.

NEW YORK METAL EXCHANGE

Headquarters, 111 Broadway, New York

At a recent meeting of the Board of Managers of the New York Metal Exchange, the following resolutions were adopted:

Whereas, In the opinion of many members of the Exchange Copper business on the floor would be facilitated if the contract was so changed as to limit deliveries to Eastern Refineries and buyer's option as to shapes, without option to deliver Lake Copper, it was unanimously

Resolved, That on and after Monday, October 29th, there should be added to the "Special Rules for Dealing in Copper" a new rule, as follows:

Rule No. 5.—Dealings in Electrolytic Copper on the Call or on the floor of the Exchange, unless otherwise specified shall be f. o. b. Eastern Refinery, and buyer's option as to shapes, subject to usual allowances and charges, without option to deliver Lake Copper on contracts. All provisions to the contrary in the Rules or Contracts are non-effective so far as concerns transactions under this Rule which shall be attached to and form part of the Contract.

Resolved, That on and after Monday, October 29th, the rooms of the Exchange be open for business between the hours of 10 and 11 A. M. and 2 and 3 P. M., with calls at 10:30 and 2:30, respectively.

C. MAYER, Secretary,
New York Metal Exchange.

New York, October 15, 1923.

WASTE MATERIAL DEALERS

Headquarters, Times Building, New York

CONSOLIDATED CLASSIFICATION DOCKET

The Consolidated Classification has issued its Docket No. 16 and held hearings on the proposed changes at 1830 Transportation Bldg., Chicago, Ill., October 9, 1923; Room 408, 143 Liberty street, New York, N. Y., October 16, 1923; Room 215, Brown Bldg., Atlanta, Ga., October 23, 1923.

The following changes are of interest to members:

Subject 67, which proposes to change the ratings on **Copper, Brass and Bronze Borings and Turnings** in Southern territory, less carload when shipped in boxes or barrels, from third class to fourth class and the carload rating from fifth to sixth class.

Subject 68 proposes in Southern territory to change the ratings on **Copper, Brass or Bronze Scrap** where it is now classified third class less carload to fourth class and in carloads from fifth to sixth.

C. F. A. METAL RATES

The Central Freight Association roads have agreed to establish, effective November 1, 1923, sixth class basis of rates with a minimum of 60,000 lbs. between points in C. F. A. Territory on Scrap Brass, Bronze and Copper, having value for remelting purposes only. Members should warn their shippers to see that the minimum weight is loaded on and after November 1. This Department has received complaints from members that the minimum weight of 60,000 lbs. in effect between C. F. A. and Trunk Line Territory could not be loaded and that this minimum on Ingot Brass as well as on Scrap was working a hardship because of a lower minimum in Trunk Line Territory. On September 27, the Traffic Manager, with representatives of Chicago members handling metals, had a conference with the Auxiliary Committee of the Central Freight Association with a view of having the minimum weight reduced and also of having the basis of rates in Central Freight Association Territory established on 85% of sixth class. The rate on Scrap Lead in C. F. A. Territory was also discussed and an application for further consideration of these questions is to be submitted to the Central Freight Association Lines.

OIL BURNER MANUFACTURERS

Headquarters, 518 Bank of Galesburg Building, Galesburg, Ill.

The American Association of Oil Burner Manufacturers, a national organization of both home and industrial oil burner manufacturers, was recently formed in Chicago. Broadcasting accurate data concerning oil burning and the oil burner industry is one of the Association's principal aims. Wallace C. Capen, Home Appliance Corporation, St. Louis, was elected president, and Leod D. Becker, Editor of Fuel Oil for Heat and Power, Galesburg, Ill., was made acting secretary. Temporary headquarters will be maintained at 518 Bank of Galesburg Building, Galesburg, Illinois, and Room 605, 20 E. Jackson Blvd., Chicago. The Association will gladly answer inquiries from interested individuals or firms concerning all kinds of oil burning.

Personals

Roy **Muir Ellis** has been appointed New England Sales Manager of The Calorizing Company, Pittsburgh, Pa. His headquarters will be in Boston, Mass.

William J. Priestly, formerly steel superintendent, U. S. Naval Ordnance Plant, and superintendent of foundries, Bethlehem Steel Company, has been appointed metallurgical engineer for the Electro-Metallurgical Sales Corporation, New York.

Paul M. Tyler has resigned as chief of the metals section of the United States Tariff Commission.

Charles P. Tolman has gone into general consulting practice, resigning as chief engineer and chairman of the Manufacturing Committee of the National Lead Company, his position for the past sixteen years. Mr. Tolman's office is in the same building (111 Broadway, New York) and he will continue as consulting engineer for the National Lead Company. He will specialize in dust and fume control, handling materials and products, and in manufacturing methods and processes particularly.

C. H. Buchanan, formerly with C. Upham Ely, is now selling nickel supplies for A. P. Munning & Company, New York.

L. **E. Wemple** has been appointed vice-president and general manager of the Illinois Zinc Company, succeeding E. H. Wolff as general manager. Mr. Wemple was formerly with the American Zinc, Lead & Smelting Company.

Harry B. Lindsay, sales engineer with the Norton Company, Worcester, Mass., has joined the staff of the C. D. Tuska Company, Hartford, Conn., in the capacity of sales manager.

Walter M. Saunders of the firm of Saunders & Franklin, analytical and consulting chemists, Providence, R. I., has been appointed chairman of the joint committee on molding sand investigation of the National Research council and the American Foundrymen's Association to succeed R. A. Bull, resigned. Mr. Saunders became a member of the American Foundrymen's Association in 1904. He had joined the American Society for Testing Materials in 1902. He has been prominent in the work of both organizations.

Resignation, due to ill health, of **Mortimer E. Cooley,** dean of the College of Engineering and Architecture of the University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies, was announced at the two-day meeting of the Executive Board of the Council held in Rochester, N. Y., October 12, 1923.

Pierce Barker, Metallurgical Engineer, has moved from Newark and is at present located in Philadelphia.

Deaths

CHARLES PROTEUS STEINMETZ

Charles Proteus Steinmetz, chief consulting engineer of the General Electric Company, in Schenectady, N. Y., died at his home in Schenectady, October 26, 1923.

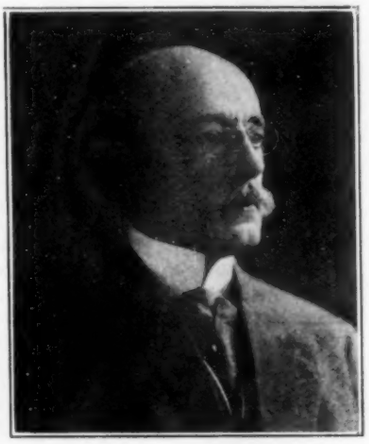
Dr. Steinmetz was born in Breslau in 1865. He came to the United States in 1888 and was engaged by the Ostefheld & Eickmeyer Manufacturing Company which was later bought up by the General Electric Company. The General Electric Company took Dr. Steinmetz with them as consulting engineer, and he worked with them all his life.

He was internationally known as an engineer and a scientist.

He was a leading authority on electricity and electrical mathematics. Because of the nature of his work and his own wide interests, he was an experienced and capable user of metals.

ALBERT REID LEDOUX

Albert Reid Ledoux, the noted mining engineer and metallurgical chemist, died October 25, 1923, at the age of 71. He was the president of Ledoux & Company, Inc., of 99 John Street, New York. Dr. Ledoux was trained in his profession at Columbia University, the University of Berlin and the University of Goettingen. In 1876 he became assistant chemist in the laboratory of Wm. M. Habirshaw. The following year he became director of the Agricultural Experiment Station of North Carolina. In 1880 he opened a laboratory and office in New York together with Professor Ricketts, under the name of A. R. Ledoux & Company. Later this name was changed to Ledoux & Ricketts which continued for five years, when it was dissolved. Dr. Ledoux continued the business under the name of Ledoux & Company together with his brother Augustus D. Ledoux.



ALBERT REID LEDOUX

Dr. Ledoux was an authority on mining, and metallurgical analysis. He was retained by the Great Northern Railway; he was made receiver of the Harney Peak Tin Mining, Milling & Manufacturing Company; he was employed by the New York State Commission to supervise the burying of electrical wires in New York City, and he was constantly being called upon for expert professional advice. It was he who persuaded European buyers of ores, mattes and blister copper to settle in full upon American assays and make payment for purchases f. o. b. New York without the delay and uncertainty which had hitherto existed in settlement upon European sampling and assaying.

Dr. Ledoux was a Fellow of the American Association for the Advancement of Science, a member of the New York Academy of Sciences, of the American Chemical Society, the Society of Chemical Industry of Great Britain, the Society of Medical Jurisprudence, the Canadian Mining Institute and a past president of the American Institute of Mining and Metallurgical Engineers. He leaves a widow, Mrs. Alice M. Baird Ledoux, and a son Louis V. Ledoux, vice-president of Ledoux & Company, Inc.

F. N. PERKINS

F. N. Perkins who was for a number of years connected with the Arcade Manufacturing Company, Freeport, Ill., died recently. He had been for the past seven years a resident of Chicago. Mr. Perkins first came into the foundry industry in 1905 through the Arcade Manufacturing Company. He was a salesman for them until 1916. He was president of the Foundry Supply Association in 1908 and 1909. From 1912 to 1916 Mr. Perkins was president of the Foundry & Machine Exhibition Company, the company being disbanded in 1916. For the past few years he had been in the real estate business in Chicago.

F. N. PERKINS

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

NOVEMBER 2, 1923.

Purchase was consummated this month of the **National Conduit and Cable Company, Inc.**, of Hastings-on-the-Hudson by **John A. Coe**, acting for the **American Brass Company** of this city, of which he is president. The purchase price is said to be $3,000,000 and the purchase includes all the real estate, factory buildings and equipment. The affairs of the conduit company have been in the courts several years. The order of sale was made absolute October 9th by Federal Judge Goddard of New York.

Ralph E. Day of this city, formerly superintendent of the **Waterbury Brass** branch of the American Brass Company, has taken over the management of the Hastings plant. The name will be changed to "The American Brass Company, Hastings Branch." The plant has a capacity of 10,000,000 of copper wire per month and manufactures conduits, cables, insulated and bare wires. The raw material for its products is furnished by the Anaconda Copper Mining Company, the owners of the American Brass Company. There is a rolling mill at the plant which has not been used for some time past which Mr. Day expects to put in operation. At present there are about 1,000 employees at the plant and this number is expected to be increased many times after the reorganization is perfected. In addition to the four Waterbury plants, two in Ansonia and one in Torrington, the American Brass Company now has plants in Kenosha, Wis., Buffalo, N. Y., New Toronto, Canada and Hastings, N. Y.

Local manufacturers state that within the past year Waterbury has begun to use its own chief products—brass and copper—more than before in local construction, due largely to the advertising campaign carried on by the **Copper and Brass Research Association.** Inquiry made by them of local builders, plumbers, roofers and builders hardware, show that brass and copper fixtures are being ordered in greater quantities each month, instead of cheaper substitutes. Hardware merchants state that sales of brass hardware, such as lock sets, door fixtures, window fixtures and kitchen and bathroom fixtures, have increased 15 per cent in the past year. Builders, plumbers and roofers state that more and more of their customers each month are specifying that the pipes inside and out, gutters, panels, etc., be of brass or copper. Copper roofing and shingles are also being ordered in greater quantities.

It is believed by the sales department of the American Brass Company that the recently laid Atlantic cable, 4,000 miles long, was woven from copper wire drawn here. The Postal Company, which laid the cable, had it fabricated by a cable company, but as it purchases most of its wire from the local concern it is believed the local wire was used in it.

John A. Coe, president of the American Brass Company, expressed great optimism for the brass industry during the coming months in an address given the Kiwanis club on the 10th. "We are apt to gauge present day business conditions by an erroneous standard, for instance by the standard when business was at its peak," he said. "Instead it should be judged by the standard of conditions before the war. There is beginning to be a considerable increase in the demand for brass and copper fixtures and furnishings in place of cheaper metals."

The local Chamber of Commerce reports that there are

about 18,000 persons employed in all of the manufacturing plants of the city that have more than 500 employees. This is a decrease of 304 since the previous month. The decrease is less, however, than for month of August when the decrease was 574. Local manufacturers deny that there is any likelihood of the factories going on short time, at least for some time to come.

E. **O. Goss,** president of the **Scovill Manufacturing Company** states, "Things are looking better. Of course we can promise nothing with regard to the future, but I expect that there will be very little short time."

High praise was given **F. S. Chase** of the **Chase Companies, E. O. Goss** of the Scovill Manufacturing Company and officers of the American Brass Company for their activities in helping form the Copper and Brass Research association, at the American Mining congress held in Milwaukee last month. It was through this association that the use of copper and brass has been popularized, and has resulted in bringing about greater sales and production of the metals.

Homer Mott of Frost road, employed by the Scovill Manufacturing Company, met with a slight accident while driving one of the industrial trucks or factory "jitneys" at the plant last month. Something went wrong with the vehicle and it started to run in a circle, finally throwing him off and breaking two ribs.—W. R. B.

BRIDGEPORT, CONN.

NOVEMBER 2, 1923.

Receivers were appointed October 15, 1923, for the **Columbia Graphophone Manufacturing Company. Mortimer N. Buckner,** chairman of the readjustment committee, later announced a reorganization plan providing for two new companies. One company will continue the operation of the present company and the other will take over and liquidate such assets of the present company as are not required for economical operation. All manufacturing and assembling operations will be centralized in this city. Stock in the new companies will be delivered to creditors participating in the plan on the basis of 3.75 shares of the operating company and 3.75 shares of the liquidating company in exchange for each $1,000 of indebtedness, principal and interest. The present 8 per cent preferred stock of the company will be exchanged at the rate of 3 shares of the operating company, 3 shares of the liquidating company and $200 in cash for each $1,000 par value of such preferred stock. The receivership is expected to be short lived.

Centralization of the manufacturing and assembling in Bridgeport will mean the stoppage of work in the Baltimore plant which is to be liquidated in the reorganization. The Toronto plant will be continued for the benefit of Canadian trade. Sale of a large part of the former **Yost** plant to the **Remington Typewriter Company** has been delayed by the receivership. Deeds are expected to be passed within a few days, however. The Remington company will then be buying back factory space it sold to the Columbia company after the war. Forces in the Remington company induced the removal of the Yost company from Bridgeport to Long Island City where it was found impossible to manufacture. Subsequently the old forces of Remington again came into control and established the typewriter supplies department in this city.

With the completion of two large new factories only about a month distant, **Jenkins Brothers** and the **Crown Corset Company** will soon be producing in buildings adding over half a million square feet of floor space to the industrial resources of the city. The new cement six story Jenkins factory on Water street which will employ many new workers on the production of bronze and iron valves is to be finished by December 1.

Carl Dietz, president of the **Bridgeport Brass Company,** will address the next meeting of the Lions Club on "How can we improve the present plan of city government?"

William B. Griffin, advertising manager of the **Holmes & Edwards Silver Company,** outlined the advertising business from the standpoint of an occupation to the Bridgeport Advertising Club at its last meeting. He urged all interested in the profession to become close students of the modern trend in advertising which is tending to develop the future advertising man as a market engineer.

"New England isn't losing prestige as a manufacturing center; it is losing its monopoly," declared **R. W. Voorhees,** middle west sales representative of the **Armstrong Manufacturing Company** of this city, attending a recent conference of department executives here. Rush demand for products in quantity has been responsible for the opening of new manufacturing centers in the West, Mr. Voorhees said. The competition of these new trade members is beginning to be felt particularly from the St. Louis, Detroit and Toledo industrial centers.—W. R. B.

NEW BRITAIN, CONN.

NOVEMBER 2, 1923.

Conditions in the metal manufacturing industry in New Britain have changed but little during the past month and with the exception of those factories whose products are more in demand because of seasonal changes there is no difference from the report of a month ago. **Landers, Frary & Clark,** whose electrical goods and household utensils are more in demand in the Fall, owing to the demands of Christmas shoppers, is going along with a full complement of employees and full working schedule, with overtime in some departments. The **Traut & Hine Manufacturing Company** also is a trifle more brisk, due to the demand for little novelties for use in holiday merchandise. The **North & Judd Manufacturing Company,** which has been feeling a noticeable decline has not suffered to any greater extent and the bottom of the depression is believed to have been reached. At the Stanley Works business is good in the wrought steel butt and hinge branch, while the hot and cold rolled steel mills are keeping up a considerable output. The **P. & F. Corbin** branch of the **American Hardware Corporation** is running along with a brisk demand for builders' hardware, especially door knobs, locks, door checks and transom rods and lifts. The **Corbin Cabinet Lock** division likewise is finding ample business while the **Corbin Screw Corporation** is very busy, especially in the automatic screw machine department. The **Russell & Erwin** division of the big corporation also has a good demand for its output of door locks, bolts, etc. The **Stanley Rule & Level Company,** makers of builders' tools, is running along with a good business and so are all of the other leading industrial concerns here.

At this writing there is every indication that the early Winter will see no diminishing of industrial output here and some of the manufacturers look for a possible increase in some of the steel and iron branches. Optimism is evident and no apparant plans for curtailing either output or number of persons employed is being considered, it is said.—H. R. J.

TORRINGTON, CONN.

NOVEMBER 2, 1923.

Lyman B. Munson, for 30 years foreman of the foundry of the **Turner & Seymour Manufacturing Company,** died at his home in Torrington, October 25, at the age of 83. Mr. Munson was born in Plymouth, Conn., but spent the greater part of his life in Torrington. He was a Mason and had held several town offices at various times. He retired some years ago from his duties at the Turner & Seymour plant.

The **Fitzgerald Manufacturing Company** has purchased from the New Haven railroad, nine acres of land on the east side of the railroad track near the Fitzgerald plant. The tract was acquired by the railroad company over 20 years ago, the original intention being to erect a freight depot there. The tract is 500 feet wide by 1,500 feet long and extends north to the holdings of the Warrenton Woolen Company. The Fitzgerald company acquired it wiht a view to future development.

A drive has been in progress here to raise $12,000 toward the operating expenses at the **Charlotte Hungerford Hospital.** Uri T. Hungerford, donor of the hospital, contributed $6,000, leaving the balance to be raised by popular subscription.

Three cars were destroyed and three trucks damaged in a fire which swept the garage at the **Union Hardware** plant during the latter part of October. The origin of the fire was not determined. Two of the cars were owned by **Thomas W.**

Bryant, president of the company, and the third was owned by the company.

A certificate of increase of capital stock has been filed by the **T. H. Wood Company, Inc.,** of Coventry, this state. The capital is increased from $30,000 to $100,000. The certificate is signed by Frank J. Damon, William Clark, Lloyd Middlekauff and Harry F. Burgess all of Torrington.—J. H. T.

ROCHESTER, N. Y.

NOVEMBER 2, 1923.

The past month has not seen much improvement in the metal industry in Rochester, most of the large plants having barely maintained an average of activity corresponding with that of the previous month. Some of the brass foundries report an increase in business, however, due to orders of an unusual or special character.

Although direct information has been withheld, it has been learned from very good authority that there has been no increase in output in such large metal-using plants at the **General Railway Signal Company,** the **Bausch & Lomb** optical works, **Eastman Kodak Company, Pfaudler** works, and **Yawman & Erbe.** From all sides prospects are reported to be of a most encouraging nature, however, and the advent of cold weather is expected to increase business in all directions.

Recent expansions to the plant of the **Stuart-Oliver Metal Finishing Company** have been announced by President **O. D. Stuart** as follows: An additional 800-gallon nickel tank which increases production of the nickel-plating department of the concern one-third. The capacity of the metal spinning department is also doubled through added equipment. Plans are being made for the enlargement of the enameling department.

On October 22, 1923, the famous **Davis Machine Tool** plant, which was a few years ago valued at $1,000,000, was sold on the steps of the court house by a receiver for $259,000. This complete tool plant was at one time one of Rochester's leading institutions, its product requiring skilled mechanics and employing immense quantities of steel, copper, brass, aluminum, lead and zinc from year to year. A strike of machinists occurred, with the final result that the business was utterly destroyed. The plant has been purchased by the **American Woodworking Machinery Company of Rochester.**—G. B. E.

TRENTON, N. J.

NOVEMBER 2, 1923.

Some of the metal manufacturers of Trenton continue busy, while others report a dropping off in business. **William G. Wherry,** president of the **Skillman Hardware Manufacturing Company,** has returned from a business trip to Harrisburg and Pittsburgh and reports receiving a number of new orders. The **John A. Roebling's Sons Company** continues busy in the metal departments.

The Trenton metal manufacturers co-operated recently in the observation of Fire Prevention Week and conducted fire drills in the various departments.

Sheriff Walter Firth recently disposed of the rights and credits of Thomas A. and Duncan Mackenzie in 275 shares of Union Electric Company stock, together with their interest in the Duncan Mackenzie Sons Company to satisfy claims by the **Waterbury Brass Goods Company, Blake & Johnson Company,** also of Waterbury, and other material firms. The sheriff also sold the Trenton Wire and Steel Company, which concern was promoted by the Mackenzies. The property brought $4,000 above a mortgage of $41,500 and taxes of $2,100. The Trenton Trust Company bought the latter plant, while the Blake and Johnson Company purchased the former concern.

Later the Duncan Mackenzie Sons' Company, Inc., was incorporated to acquire the foundry, machinery and pottery industry now operated under the Mackenzie name at that address. The capitalization is $180,000.

The **Globe Metal Novelty Manufacturing Corporation,** of 93 Mechanic street, Newark, N. J., has suspended business with $100 available in cash in bank. Vice Chancellor Foster has named Charles J. McCarthy as receiver. Louis A. Mikowsky, of Mount Vernon, N. Y., claims a salary as manager of the concern. The corporation was chartered in December of last year with an authorized capitalization of $50,000.

Vice Chancellor Backes has appointed **Hyman Friedman** of Perth Amboy, N. J., temporary receiver for the **Middlesex Lighting Company,** upon application made by the **London Lighting Ware Corporation,** of New York City, a creditor. The Middlesex Company was organized last February with a capitalization of $100,000. Last July fire destroyed the company's factory and all its assets.

Vice Chancellor Backes has continued **Nicholas La Vecchia** as receiver for the **Zamium Corporation,** of Newark. The concern built a factory in Boonton, N. J., at a cost of $125,000, and is said to have neglected the exploitation of an alloy alleged to have been invented by **Lawrence Zamboni,** of New York. The alloy is said to take the place of platinum.

The **H. and H. Electric Company, Inc.,** of Newark, has been incorporated with $5,000 to deal in electrical supplies.

Max Lehman Metal Company, of 77 River Street, Hoboken, has been incorporated with $50,000 capital stock divided into 500 shares of $100 parity. The company will manufacture metal. The incorporators are Max Lehman, 1024 Bloomfield Street, Hoboken, and Henry I. Haberman and Mortimer Lehman, of the same address.

The **Groundlet Company,** of Summit, N. J., has been incorporated with $1,000 capital to manufacture electrical fittings. The incorporators are Stephen W. Borden, Vera Borden, Richard L. Corby and Herbert C. Gilson, all of Elizabeth.

The **American Fused Silica Corporation,** of New Brunswick, has been incorporated at Trenton to manufacture fused silica ware under the patents of **Armin Frost.** The incorporators are Whitfield Farrington, Richard F. Potter and Paul W. Ewing.

The **Industrial Minerals and Metals Company,** of Perth Amboy, N. J., has been incorporated at Trenton with $125,000 capital to manufacture metals. The incorporation papers were filed by **H. S. Predmore** of New York City.

The **T. and L. Company, of** Newark, N. J., has been incorporated at Trenton with $50,000 capital to deal in hardware.

Siggins, Mandall & Dowling, Inc., of East Orange, N. J., has been incorporated at Trenton with $25,000 capital to deal in hardware.

The **Suresnap Company,** of East Orange, N. J., incorporated at Trenton with 1,000 shares no par value, will deal in jewelry.

Fred F. Gloeckner, Inc., dealer in electrical supplies, has been incorporated with $25,000 capital to do business in Newark.

Brown and Bedner Manufacturing Company, of Newark, N. J., has been incorporated at Trenton with 1,200 shares, no par value, to manufacture and deal in metal novelties.

Goodwin-Pray, Inc., of Elizabeth, N. J., has been incorporated at Trenton with $50,000 capital to manufacture electrical machinery.

The **Bidwell Hardware Company,** of 668 Newark avenue, Jersey City, has been incorporated to manufacture and deal in hardware. The incorporators are Joseph P. Montague, North Bergen; Charles L. Calfiero, Jersey City, and Madeline Gandeofo, of North Bergen.—C. A. L.

PROVIDENCE, R. I.

NOVEMBER 2, 1923.

Increased activity in general building lines and the holiday season trade among the manufacturing jewelry and coordinate lines are reflected in the constantly repeated calls through the daily press and otherwise for additional labor and indicate a substantial rounding out of business for the year. Although much below normal, business in the metal lines during the year as a whole has been a decided improvement over the preceding one and there is a prevailing sentiment in favor of a continuance of improvement during the coming year.

A problem that is receiving careful consideration at the present time on the part of those interested in the manufacturing jewelry industry is the question as to where the expert, trained designers and bench hands of the future are to come from. The apprentice system has been almost completely

eliminated by the condition which grew up during the war and following it. Previous to the war there had been a growing tendency toward fewer apprentices but so many expert workmen were withdrawn from the industry during the war period for governmental and other work for which higher renumeration was given that a large percentage of experienced tool handlers were lost to the industry, hundreds of whom have never returned to the trade. Specialization in the industry has also eliminated the production of the expert artisans that in former years were the strength of the jewelry industry. So serious is this problem becoming that the past month it was taken up for consideration at a conference between superintendents and foremen representing more than fifty manufacturing jwelry establishments of Providence and the Attleboros, with officials of the **New England Manufacturing Jewelers' and Silversmiths' Association** and of the **Rhode Island School of Design,** for the purpose of securing a larger number of young men from the jewelry shops to take the part-time vocational courses in jewelry making, engraving, designing, toolmaking and other branches of the jewelry industry, as afforded by the excellently equipped jewelry and silversmithing department at the school.

As a result of that conference a committee of seven foremen was appointed to visit the school, study the curriculum of the jewelry department, confer with the officers of the school and to present a plan for a more general interest on the part of the jewelry manufacturers of this section in the work of the school and the sending of a larger number of young men from the shops for training in the institution. This instruction is given the boys without any expense to the firms employing them, except the few hours each week that they are excused from shop duties to attend the classes. The New England Manufacturing Jewelers' and Silversmiths' Association some three years ago, when the new building devoted entirely to the jewelry and silversmithing department was opened, raised by subscription among the manufacturing jewelers of Providence and the Attleboros more than $25,000 which was used in equipping the department so that it has one of the most up-to-date appointments to be found in this, or any other country, for doing the work designed.

The **Warren Foundry** at Warren, is being operated on full time and the new owners, Frank F. Archibald and Dungald Hall are very optimistic as regards the outlook. They have work enough ahead to assure them of an active Winter and plans have already been drawn for a material increase in the size of the plant in the Spring. For several years the plant has been used as an iron foundry but the new owners have installed considerable new machinery and equipment so that the plant is now turning out a large tonnage of brass work. The plant will be operated as a general job foundry. It is located on Cutler street, Warren.

The extensive plant of the Brown & Sharpe Manufacturing Company on October 22 began operation on a 40-hour week schedule which will be continued for an indefinite period, because of a depression in business. The plant will shut down all day Saturday and at 4 o'clock the other five days.

At the annual corporation meeting of the New England Manufacturing Jewelers' and Silversmiths' Association held at Providence on the evening of October 27 the following officers were elected: Vice Presidents for one year, Frank P. Daughaday, of Freeman-Daughaday Company, Chartley, Mass.; Clarence J. Roehr, of the Bassett Jewelry Company, Providence and Charles A. Whiting, of the Whiting & Davis Company, Plainville, Mass.; Secretary for one year, Morgan W. Rogers of Parks Brothers & Rogers, Providence; treasurer for one year, Newton P. Hutchison, of Hutchison & Huestis, Inc., Providence; Directors for three years, Arthur L. Bottomley of F. H. Sadler Company, Attleboro; William P. Chapin, Jr., of Chapin-Hollister Company, Providence; Edwin H. Cummings, of the General Chain Company, Providence; Joseph Finberg, of the Finberg Manufacturing Company, Attleboro; Frank M. Graham of the Gorham Manufacturing Company, Providence; William G. Lind of T. W. Lind & Company, Providence; Andrew Morris of G. C. Hudson & Company, North Attleboro, and Frederick Schwinn of the Robbins Company, Attleboro. These directors, with the remainder of the Board will meet within ten days, organize for the year and will elect a president and manager.—W. H. M.

DETROIT, MICH.

November 2, 1923.

To meet specifications more fully for wire used in winding armatures of starter generators with which Ford cars are equipped, the **Ford Motor Company** has gone into the manufacture of wire just the same as it is now manufacturing glass, artificial leather and paper. The new industry has been established in the company's Highland Park plant, and though not yet in full production, is turning out some 70 miles of fine insulated wire each day. The manufacture of 6,500 generator units daily calls for absolute standardization of parts, particularly wire size. If the winding on the armature is only slightly off size or if the insulating cover is a bit thick or irregular, either the winding will not fit in the armature segments or lower generator efficiency will result. In order to obtain uniformity, the Ford Motor company decided to make its own wire, and consequently has installed its own wire making machinery. One interesting drawing operation is where the wire passes through eight pierced diamonds each reducing the size of the wire a few thousandths of an inch. Each diamond cost about $300.

The Ford Motor company is now operating a large valve plant at Northville, Mich., a small village a few miles from Detroit. The product is used in the construction of Ford cars, trucks and tractors. At present 350 men are employed in three eight-hour shifts and are turning out 85,000 model T valves and 10,000 tractor valves daily or approximately 2,500,000 valves a month.

Under the name of Durex, the **General Motors Corporation** is marketing a new porous, oil absorbing, copper-tin bearing bronze. The new product, the result of long and exhaustive experiment and test, possesses a large number of pores which will absorb lubricating oils or greases up to 25 per cent of the volume of bearing. Under test it has been found of use in any place in which bearing material is ordinarily used, and in many cases, it is claimed has even satisfactorily replaced ball and roller bearings. Thousands of tiny pores, uniformly distributed throughout Durex give the material absorbing qualities of a blotter or a wick. It not only soaks up oil, but what is more important while still in a bearing will not drain out again.

The **Detroit Aero Metals Company,** 657 Lycaste avenue, is erecting a new plant in which will be manufactured on a large scale aluminum, glucinum and potassium bicarbonate. The structures eventually will cover many acres and include six units. The company's officers are J. E. Thompson, president, and chairman of the board of directors: G. L. Williams, vice-president and plant director; D. E. Briggs, secretary; F. L. Woodworth, treasurer; E. C. Parsons, vice-president and general manager; G. E. O'Dell, assistant treasurer.

The **Detroit Auto Specialties Company,** a subsidiary of the **Hupp Motor Car Corporation,** is planning the construction of a new factory building to cost $350,000. The structure will be one-story high, 504 by 120 feet and located at Mt. Elliott avenue and Dunn Road, in the rear of the Hupp Corporation's main plant. It is scheduled to be completed about January 1. The new structure will provide double the company's present manufacturing area.—F. J. H.

PITTSBURGH, PA.

November 2, 1923.

In Philadelphia, an improvement in the demand for skilled labor is especially noticeable, says **Kenneth M. Coolbaugh,** superintendent of the state employment office. One of the city's largest industries which has not made any additions to its working force in the last six weeks has placed orders for boring mill, milling-machine and drill-press operators.

The improvement in construction work, which has been apparent the beginning of October is still manifest. Orders are coming from contractors and builders for work in the city and up-state. Riggers, carpenters, steam fitters and fitters' helpers are most in request.

The **American Bosch Magneto,** which some time ago purchased the plant of the **Reading Standard Motorcycle Company,** sold it to Keyser Fry, this city, who will occupy it with a bicycle and bicycle accessories jobbing business.

Jewelry sales are steadily increasing, says wholesalers.

Clock manufacturers report an excellent call for nearly all styles. Deliveries on some lines are held up to such an extent that business is somewhat retarded.

Pittsburgh, which contributed freely to the relief of the Japanese stricken by earthquake and tidal wave, will produce the greater part of the material going to fill a $1,000,000 contract given the **Westinghouse International Company** for reconstruction work in Japan, it was announced yesterday by the **Westinghouse Electric and Manufacturing Company,** East Pittsburgh, Pa.

The order, officials said, includes apparatus and machinery to be used in the rebuilding of Japan's electrical system, well-developed before the earthquake. The greater part of the contract will be filled at the East Pittsburgh plant.

President **S. M. Vauclain,** president of the **Baldwin Locomotive Company,** says, "Shipments this year will approximate $100,000,000. Orders for parts and repair work are heavier than any time this year."

The reorganization committee has issued notice to creditors of the **Habirshaw Electric Cable Company, Habirshaw Electric Cable Company, Inc., Electric Cable Company,** and **Bare Wire Company, Inc.,** declaring the reorganization plan operative and time for deposit of claims of creditors under the agreement has been extended to October 31. Claims aggregating 80 per cent of the total have been subjected to the plan.—H. W. R.

MONTREAL, CANADA

November 2, 1923.

The majority of firms believe that they are receiving their share of business in view of the conservative attitude being maintained by buyers and jobbers. Electrical manufacturing firms have been working steadily for the past month. There has been considerable power development in Northern Ontario and Quebec recently and the sales have been good. The constantly increasing use of electrical power in industry and the home, also the expansion in the pulp and paper industry has created a demand for considerable equipment.

Canadian Vickers, Ltd., Montreal, have delivered five of the eight aeroplanes which were ordered last winter. This order was for eight Vickers Viking amphibian aeroplanes and it resulted in the establishment by Canadian Vickers Ltd., of a modern aircraft factory at Montreal.

This firm is now in a position to build all classes of flying machines manufactured by Vickers Ltd., England—P. W. B.

BIRMINGHAM, ENGLAND

October 19, 1923.

According to the latest available official returns British trade is expanding. At no period of the present year has the total fallen to a point corresponding to the lowest recorded in 1922. The total imports for September showed an increase of £6,500,000 over those of September, 1922, whilst the exports were £63,836,144 as against £60,103,360 in August and £62,511,099 in September last year. Taking the nine months of 1923 as compared with the corresponding period of last year exports show an advance of £31,398,-614. In the non-ferrous group increases are shown in aluminium, brass, copper, alloys of copper, lead, tin and zinc. Last month's exports of wire were four times those of September, 1922. Electrical goods and apparatus are among the items in which exports have increased.

Whilst the figures are such as to encourage optimism, the state of the Midland non-ferrous industries leaves much to be desired. Brassfounders, who for many months were better employed than the majority of other manufacturers, have experienced a considerable falling off in business during the last few weeks. For cabinet brass particularly orders are by no means numerous. Rolling mills are less busy than they were a few months ago and the wire-drawers are experiencing only a moderate demand. Seasonal influences have caused a slight improvement in some departments. The fender and hearth furniture manufacturers have had a good season so far. Makers of gas and electric light fittings are for the present well employed. The demand for electrical goods has been stimulated by the rapid extension of domestic installations, the applications for which in Birmingham have been four times as many this year as last.

A temporary briskness is observable in small silver and plated goods. In the plate trade generally the orders are not so numerous as is usual at this time of year. Prices are lower than they were a year ago. The bulk of the business now being done in electroplate and white metals is in spoons and forks. Amongst the articles for which the Admiralty invite tenders are 31,000 table forks, 30,000 table spoons, 24,000 dessert spoons, 26,000 tea spoons all of nickel silver unplated, and 32,000 table and dessert knives with plated handles, besides entree dishes and other table vessels. These orders are to cover the year's supply. A lull has prevailed in regard to metal work for the motor trades, but it expected that after the London shows the revival which commenced in the summer will resume with accelerated progress, in view of the enterprise of the car firms in improving and cheapening their productions.

Stagnation in shipbuilding is responsible for a good deal of the lack of employment in the Midland brass and other metal industries. The prolonged lock-out of the boilermakers, due to their refusal to accept the terms agreed to by all other workers in the shipyards, affects directly some 10,000 men and is holding up the work of 60,000 others. During the past fortnight renewed efforts to bring about a settlement have been made by the Mayors of the northern seaport towns, the national trade union leaders and others, but up to the present there is no prospect of the boilermakers giving way. The non-ferrous requirements of the shipbuilders for machinery and structural purposes, together with ships' fittings of all kinds are largely made in this district. Makers of ships' lamps amongst others are suffering from the idleness in the ship yards.

PLATINUM STANDARDS

The question of an authoritative standard for platinum has been during the last few years the subject of recommendations from the Jewelers' and kindred associations in Great Britain. In view of the increasing use of platinum in jewelery as well as for various other purposes in regard to which a standard of purity is a desideratum, it was considered that a system of official assay and hall-marking of platinum wares should be instituted. The recommendations made have been taken into consideration by the Assay Offices in Birmingham, Sheffield and London, but on account of the cost of the necessary plant and the state of their finances, the Assay authorities have replied that they cannot undertake the work at present. There is no immediate prospect of anything further being done in the matter.

RESEARCH IN METALS

The British National Physical Laboratory is continuing its research on the effect of impurities in copper for the British Non-Ferrous Metals Research Association. An investigation has been begun on methods of determination of alumina and its effect on aluminium and its alloys. A survey of information on the physical constants of commercially pure metals has been made, and work on the determination of certain constants has been commenced.—G.

Business Items—Verified

The **Waller Manufacturing Company** has been organized in East Dubuque, Ill.

Hedderich Brothers, Bond Street, Evansville, Ind., operating a brass and bronze foundry, are arranging a list of equipment for installation in its proposed one-story addition.

The **American Quick Coupling Company,** Robert Dollar Building, San Francisco, Cal., has arranged for the manufacture of a new type of metal coupling, E. C. Northrup and Arthur Browne head the company. This concern operates a brass machine shop.

Thirty-seven representatives of the **Black & Decker** Manufacturing **Company,** Chicago, Ill., will attend the Automotive Equipment Association Convention and Exhibit in Chicago, November 12 to 17.

The **Hungerford Brass & Copper Company,** 95 Broad street, Boston, Mass., has under construction a new two-story warehouse 80 x 240 ft. at 411-429 D street, South Boston; estimated cost $120,000. Wm. E. Austin, 46 West Twenty-fourth street, New York, is architect.

Charles Piez, president of the **Link-Belt Company,** Chicago,

Ill., announces the purchase of the Meese & Gottfried Company, of San Francisco, Los Angeles, Seattle and Portland. The new organization will be known as **Link-Belt Meese & Gottfried Company** with headquarters at San Francisco.

The **Prime Manufacturing Company,** Milwaukee, Wis., is contemplating the erection of a brass foundry of approximately 15,000 to 18,000 sq. ft. No definite plans have as yet been made. This concern operates the following departments: brass, bronze foundry, brass machine shop, tool room, grinding room.

The **Mond Nickel Company, Ltd.,** of London, England, according to reports, has purchased the minority stock previously held by Charles T. Hennig and G. P. Bassett, Jr., and is now the sole owner of the American Nickel Corporation, Clearfield, Pa., manufacturer of 99 per cent pure malleable nickel.

The **Metalweld Service Corporation,** 1435 North 31st Street, Philadelphia, Pa., operating a welding and general metal works, has acquired property at Hunting Park Avenue and Fox Street for $60,000 as a site for a new factory for which plans will soon be prepared. This concern operates the following departments: brazing and welding.

James B. Clow & Sons, Harrison and Franklin streets, Chicago, Ill., operator of gray iron, brass and aluminum foundries, have purchased the plant of the Sullivan Machinery Company of that city. This concern operates the following departments: brass foundry, brass machine shop, tool room, grinding room, spinning, plating, polishing, lacquering.

M. Greenberg's Sons, announce the removal of their brass foundry, machine works, plating and pattern works from 225 Beale street, to their new building located at 765 Folsom street, San Francisco, Cal. This concern operates the following departments: Brass, bronze and aluminum foundry, brass machine shop, tool room, casting shop, plating, polishing, lacquering.

The **John Polachek Bronze & Iron Company** is erecting a two-story addition, 150 x 200 ft., at its plant at 480 Hancock street, Astoria, L. I., estimated to cost over $150,000. This concern operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, casting shop, cutting-up shop, brazing, soldering, polishing, lacquering.

The **C. & G. Pattern Works,** 233½ Maryland street, Indianapolis, Ind., has bought the Modern Brass Foundry Company, Indianapolis, recently bankrupt. The C. & G. Pattern Works expects to operate a modern foundry with first-class pattern shop, polishing and plating departments making brass, bronze and aluminum castings, metal auto accessories, such as step plates and radiator caps. They are in the market for good virgin metals, free from iron. This concern also operates a brass, bronze and aluminum foundry grinding room.

The **General Briquetting Company,** New York City, announces the appointment of Thomas F. Kelly of Buffalo, N. Y., as manager of the Smelters' General Briquette Corporation, specializing in the manufacture of briquets for smelting purposes. The new corporation has been organized to succeed the metallurgical department of the General Briquetting Company. Ellsworth B. A. Zwoyer of Perth Amboy, N. J., has been appointed manager of the General Fuel Briquette Corporation, organized to succeed the fuel department of the General Briquetting Company.

The **Rhodolite Company of New York, Inc.,** recently organized by Warren R. Palmer, 149 Broadway, New York, and associates, has leased the abrasive properties of the Carolina Abrasive Company near Willits, N. C., and plans the installation of machinery for development and operation, including electric power equipment. It is purposed to purchase and assemble the equipment in New York, and remove as a unit to the plant. R. S. Perry is directing engineer.

The **Maryland Metal Products Company** plant at Hagerstown, Md., has been acquired at auction by the **Poole Engineering & Machine Company,** Baltimore, for $160,000. The Poole Company used the plant during the war to fill contracts and owned 50 per cent of the bonds of the company. Plans for the future use of the work have not been formulated. This concern operates the following departments: tool room, cutting-up shop, galvanizing, brazing, japanning, stamping.

Contracts aggregating $1,000,000 have been placed for manufacturing machinery and equipment to be used in the cable and telephone switchboard works that the **Western Electric Company** is erecting on its Kearny, N. J. property, it was announced by the company in the daily press. Ten pile drivers are at work on the construction of the new 1,600-ft. bulkhead. Present plants call for the employment of 600 men on the sixty-acre tract next fall. This will be the first contingent of the 30,000 employes who will work in the first group of buildings in the Kearny works.

INCORPORATIONS

The **Hamilton Beach Manufacturing Company,** manufacturers of electrical apparatus, was incorporated for $50,000. Incorporators are Edward O. and John H. Goss, and Leavenworth P. Sperry, 145 Buckingham Street, Waterbury, Conn. Address correspondence to headquarters of this company in Racine, Wis.

The **Elbe Brass Company** was incorporated for $10,000 in Columbus, Ohio, recently. It will do business in Cincinnati. Henry Elbe and William Elbe, Sr., were among the incorporators. This concern operates the following departments: brass machine shop, tool room, grinding room, cutting-up shop, stamping, tinning, soldering.

Pennsylvania Brass & Copper Company, Erie, Pa., was incorporated for $50,000, to manufacture brass, copper, bronze and kindred products. E. S. Roach, Erie, is treasurer and representative. This concern operates the following departments: seamless brass and copper tube mill, brass foundry, brass machine shop, tool room, cutting-up shop.

BUSINESS TROUBLES

The **Modern Brass Foundry Company, Inc.,** Indianapolis, Ind., filed suit in volnutary bankruptcy in federal court recently listing liabilities at $14,763.66 and assets at $4,648.11.

Notice was given that on the 20th day of September, 1923, William Sarti, trading as the **Passaic Carpenter & Millwright Shop,** was duly adjudged a bankrupt, and that the first meeting of his creditors was held at the United States District Court Room at the Court House, in the City of Hackensack, in said District, on Wednesday, October 31, 1923.

Judge John C. Knox, at a hearing in United States District Court, declined to pass upon the reorganization committee's motion for a receiver's sale of the properties of the **Habirshaw Electric Cable Company** until all dissenting creditors and stockholders could be heard. Following argument in which counsel for the dissenting group charged that there was "grave question" as to the need of from $1,500,000 to $2,000,000 of additional capital, which under the plan would be raised by the issue of preferred stock, Judge Knox set Friday, November 9, 1923, as the date for further hearing.

Edward W. Hellier of New York recently brought in the District Court a bill in equity against the **Baush Machine Tool Company** of Springfield, Mass., and others. The bill alleged that the directors and officers of the Baush Company including the defendants took over the property of the Huron Metals Company which had a fair valuation of about $50,000, by its exchange for 22,500 shares of stock of the Baush Company valued at between $2,200,000 and $3,500,000. The defendant's answer on which argument was heard stated that the property purchased from the Huron Metals Company was amply worth the consideration paid and that the transaction was in no way disadvantageous to the Baush Company. Every allegation of fraud is denied.

NO GUARANTEE AGAINST PRICE DECLINE

A rumor was circulated that the American Brass Company was guaranteeing selling prices of finished products against decline. This was flatly denied by that company. The American Brass Company has never guaranteed prices against decline, the policy of the management being opposed to such methods in business.

It is stated that the American Brass Company is today operating at rates varying from 80% to 90% of capacity.

AMERICAN BRASS TAKES NATIONAL CABLE

The National Conduit & Cable Company at Hastings-on-the-Hudson, N. Y., has been bought over by the American Brass Company. Ralph E. Day, superintendent of one of the Waterbury plants, has been placed in charge of the Hastings plant, which has a capacity of 10,000,000 pounds of copper wire per month. It manufactures conduits, cables, insulated and bare wires.

INTERNATIONAL NICKEL CONVENTION

Sales agents and executive officers of the International Nickel Company gathered at the mill for their annual convention October 26th to the 31st.

The routine of the ordinary sales convention was swept aside by the enthusiasm created for the remarkable developments shown at the mill. In about one year the International Nickel Company has transformed an eighty acre cornfield into the most modern rolling mill in the world. While the manufacture of most non-ferrous metals is standardized and years of experience guide the erection of new plants, no such data existed to direct the layout of a mill for the production of Monel metal and nickel—both of which are very refractory.

Through the initiative of its own personnel the International Nickel Company has overcome the lack of standardized machinery of previously standardized mill practice and help skilled in the production of Monel metal and has put into operation a complete plant capable of producing Monel metal and nickel at the rate of three million pounds per month. By the erection of this mill it is now said to be possible to deliver Monel and nickel with less delay than is ordinarily encountered in securing mill shipments of almost any other fabricated metal.

TRADE PUBLICATIONS

Flow of Moulding Sand.—A booklet issued by Whitehead Brothers Company, 537 West 27th Street, New York, covering Whitehead's Albany sand.

Rust.—A folder issued by the Copper & Brass Research Association, 25 Broadway, New York City, on how to protect homes from fire, lightning and rust.

Metex. A folder issued by MacDermid Incorporated, of Waterbury, Conn., concerning the treatment of metals preparatory to plating, lacquering, enameling, assembling, etc.

Kenworthy Non-Oxidizing Annealing Furnaces.—Bulletin No. 91, issued by Charles F. Kenworthy, Inc., Waterbury, Conn., on their various types of non-oxidizing annealing furnaces.

Recuperator Utility Furnaces.—Bulletin No. 52 R., issued by the Combustion Utilities Corporation, 8 Bridge Street, New York, presenting a new line of tile recuperator furnaces for the enameling industry.

A Molding Sand Bibliography.—A booklet issued by Whitehead Brothers Company, 537 West 27th Street, New York, giving an outline of leading articles on molding sand appearing during the last ten years.

Portable Coilers. A folder issued by the Blake & Johnson Company, Waterbury, Conn., on portable coilers for cold rolling and finishing machinery for strips and sheets. It also gives standard specifications.

Hauck Venturi Low Pressure Oil Burner.—Bulletin No. 506, issued by the Hauck Manufacturing Company, 126 Tenth Street, Brooklyn, N. Y., illustrating and describing the new Hauck Venturi Low Pressure Burners.

A Text Book on Ajax Ingots.—A booklet issued by the Ajax Metal Company, Philadelphia, Pa., giving advice to users of ingot metals. It also lists Ajax standard alloys and gives information on their melting and casting.

Importance of Service Equipment to the Jobber.—A booklet issued by R. W. Proctor, Sales Manager, the Black & Decker Manufacturing Company, Chicago, Ill., containing charts on automobile repair and service stations.

Crawlproof Sheet Lead.—A booklet issued by the Hoyt Metal Company, Boatmen's Bank Bldg., St. Louis, Mo., on its reinforced sheet lead lining for use in hot acids, fumes, etc., to prevent buckling, or crawling of the sheet.

Hisey Ball Bearing Grinding Machines.—Bulletin No. 1305, issued by the Hisey-Wolf Machine Company, Cincinnati, Ohio. This bulletin illustrates and describes the company's new and improved Two Wheel Floor and Bench Grinders.

Motorbloc—The Motor-Driven Chain Hoist. Bulletin, S-101, issued by the Motorbloc Corporation, Summerdale, Philadelphia, Pa., illustrating and describing the application of Motorbloc. A tabulation of capacities, speeds, weights and electric motor sizes is given.

Bristol's Tachometers.—Bulletin No. 317, issued by the Bristol Company, Waterbury, Conn., illustrating and describing their tachometers, both recording and indicating models. Two types of tachometer equipment are described in this bulletin: the Pneumatic and the Electric.

Friction Clutches. Catalog No. L-28, issued by W. A. Jones Foundry & Machine Company, Chicago, Ill., containing data on "Lemley" friction clutches. Sleeve clutches, cut-off couplings, clutch pulleys, ball bearing clutch pulleys and gas engine clutch pulleys are completely covered.

Mechanical Plating. A booklet issued by B. Merril & Sons Plating Company, 1907 Fulton street, Chicago, Ill., on mechanical plating and finishing. It contains illustrations of pieces plated mechanically and some general information about the treatment of mechanically finished work.

Molding Sand Economy.—A booklet issued by Whitehead Brothers Company, 537 West 27th Street, New York. It contains chapters on cleaning, sand burning on castings, machine molding, Whitehead's sands. At the back of the booklet is listed the sands Whitehead Brothers Company produces.

Pulleys. Catalog No. 27, issued by W. A. Jones Foundry & Machine Company, 4401-51 West Roosevelt road, Chicago,

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Act of Congress of August 24, 1912, of THE METAL INDUSTRY, published monthly at New York, N. Y., for October 1, 1923.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Palmer H. Langdon, who, having been duly sworn according to law, deposes and says that he is the publisher of THE METAL INDUSTRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Palmer H. Langdon, 99 John street, New York; Editor, Palmer H. Langdon, 99 John street, New York; Managing Editor, Adolph Bregman, 99 John street, New York; Business Managers, Geo. W. Cooper and Thos. A. Trumbour, 99 John street, New York.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock.) The Metal Industry Publishing Company, 99 John street, New York; Palmer H. Langdon, 99 John street, New York; L. J. Langdon, 99 John street, New York; Thos. A. Trumbour, 99 John street, New York; John B. Woodward, 99 John street, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities, are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct in the said stock, bonds, or other securities than as so stated by him.

Sworn to and subscribed before me this 9th day of October, 1923.

[Seal]

THE METAL INDUSTRY, Palmer H. Langdon, Publisher.
O. B. LEWIS, Notary Public, Kings County Clerk No. 24.
(Commission expires March 30, 1924.)

Certificates filed: Kings County Register, No. 4,025.
New York County Clerk No. 40, Register No. 4,032.

Ill., giving information on cast iron pulleys. It also describes, illustrates and lists "Lemley" ball bearing loose pulleys and ring oiling loose pulleys; steel, wood and paper pulleys.

Engineering Education and American Industry.—Special Report No. 25, issued by National Industrial Conference Board, 10 East 39th street, New York City. It is the purpose of this report to show clearly the interrelationship between the engineering schools and the industries and the need for co-operation of the two organizations interested in the development and successful functioning of leadership in industry.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$500	$550
American Hardware Corporation	100	57	60
Anaconda Copper	50	35	35¼
Bristol Brass	25	5	9
International Nickel, com.	25	10⅞	10⅞
International Nickel, pfd.	100	74	76
International Silver, com.	100	60	...
International Silver, pfd.	100	102	105
National Enameling & Stamping	100	40½	40⅝
National Lead Company, com.	100	120½	121½
National Lead Company, pfd.	100	110½	112½
New Jersey Zinc	100	137	143
Rome Brass & Copper	100	115	125
Scovill Manufacturing Company, new	..	187	192
Yale & Towne Manufacturing Co., new	..	62	64

Corrected by J. K. Rice, Jr., Co., Wall Street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

The month of September closed with further reductions in the prices of brass and copper materials in the form of rod, sheet, tube and wire. It was expected that the prices of manufactured products would follow the ingot copper price, which has been sagging for some time and the reduction in manufactured articles which took place on October 26th was, therefore, no surprise to the trade. The brass and copper rolling mills have naturally felt the curtailment in general business activities and the tendency on the part of buyers to withhold orders in the face of a declining market. Therefore, many of them are rather short of business for advance deliveries although there has been a very fair amount of business placed from day to day for immediate requirements. As a matter of fact, it has been very gratifying to the mill operators to note that this business placed from day to day has totalled a sufficient volume to keep the forces of the mills employed steadily and that in most of the mills there has been practically no reduction in the operating forces. In some departments, the brass and copper mills are very busy. There is no very great expectations for an advance in prices unless and until there has been a very radical change in the tendency of ingot copper prices.

There have been some very heavy installations of monel metal in some of the textile mills in various parts of the country during the past month and the tonnage resulting from these installations has run into very large figures. Bookings of both Monel metal and nickel continue at a rate which is very gratifying in the face of the general business situation.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Prices of copper continued on a downward movement in October, but the decline failed to create a sufficiently broad demand to arrest the sagging tendency of the market. The break in the local and London markets resulted in a material slowing down of buying by domestic consumers. Sales were in fair volume, however, but were made possible by frequent concessions in prices. Electrolytic, which was quoted at 13⅜ cents a pound on October 1st, was being offered at end of the month at 12½ to 12⅝ cents.

The marked increase in production at South American properties in the past six months and the unsettled conditions in Europe made for a steadily weaker copper market. Over-production in this country and under-consumption abroad has thrown the copper industry out of balance. Surplus stocks have consequently increased, and the result has been the lowest selling prices in over 18 months. Inquiries were increased lately and moderate sales were made for domestic and export account on the basis of 12⅜ to 12½ cents. Closing quotations for electrolytic are 12½ to 12¾ cents for delivery up to end of January.

ZINC

Business in zinc settled down to very moderate buying for a good part of October, but the end of the month witnessed a somewhat firmer tone to the market. Offerings are made with more reserve, but domestic consuming demand remains on a restricted scale. Dealers have been bidding for supplies of prime Western grades and some inquiries were made for Japanese account. The total outcome in sales, however, cut a small figure and the market closed quiet at 6.30 to 6.35 cents E. St. Louis and 6.65 to 6.70 cents New York basis.

TIN

There was moderate domestic buying of tin in the last 30 days, with irregular market values as periodic features according as the foreign trend became evident. London and Singapore movements claimed special attention. Operations at both those centers lately were in heavy volume. Eastern holders were free sellers, showing important liquidation of Federated Government stocks. Consumers are not inclined to buy heavily at present, but follow a conservative hand-to-mouth policy in covering actual requirements. Spot straits quote 41½ to 41¾ cents and November-December shipments 41⅜ to 41½ cents. Market is fairly firm. Arrivals of tin in October at Atlantic and Pacific ports were 6,855 tons, but full returns were not completed as we go to press. Tin shipments afloat for this country were 4,119 tons.

LEAD

The demand for lead has remained steady in good volume, and actual orders from consuming industries reflect a good movement into consumption. The leading producer, however, reduced the price basis to 6.75 cents New York—a decline of 10 cents per 100 lbs. The trade was somewhat surprised at this reduction as the position of lead appeared to be free from heavy over-supplies. Buyers, however, follow a conservative policy and a downward readjustment may create more substantial orders. The unsettled feeling regarding the future of general business gives the impression that supplies will be ample for the balance of the year.

The Missouri owned lead mines of the Federal Lead Company have been sold to the St. Joseph Lead Company for $10,000,000. The Federal properties were a subsidiary of the American Smelting & Refining Company. Under the new arrangement the Smelting Company obtains a 30-year contract for smelting a large proportion of the combined output of ores from the new combinations. Recent lead output of the Federal mines was reported at about 3,000 tons per month.

ALUMINUM

A moderate volume of business was placed in October. Price basis showed little variation during the last 30 days, and

the market may be properly described as consistently steady for all grades. Quotations are 26 to 27 cents for virgin ingot of 99% plus, delivered terms, and 25 to 26 cents for 98-99% metal.

ANTIMONY

Inquiries for antimony have increased lately and the market is considerably firmer than it was a few weeks ago. Some business in spot and November delivery is reported at 8.25 cents duty paid. Resale metal to arrive is held at 6.50 cents c. i. f. in bond. Chinese offerings are made with more reserve and this fact tends to give the market a strong tone. Trading, however, is quiet, with 8½ cents quoted for Chinese in carload lots, duty paid.

QUICKSILVER

While demand is confined to moderate dimensions in the quicksilver market, there are rumors of a possible improvement should spot stocks be moved out of the way by a brisker demand. Foreign prices have been firmer lately, but domestic quotations have remained on basis of $60 to $61 for 75-pound flasks. London, Italy and Spain have been firm for all shipments.

SILVER

The specially interesting fact regarding silver is that New York is apparently becoming a more important market for the white metal than London. The Orient has realized that the primary market is in this country and not in the British center. Accordingly direct shipments to China and India have been heavy recently, the takings in September for these two countries amounting to over 12,000,000 ounces. Substantial amounts were also taken by London. World production at present is at the rate of about 15,000,000 ounces a month, and American offerings lately have averaged about 2,000,000 ounces weekly. The new Silver Export Association represent a product of more than two-thirds of the total yearly production. Imports of silver into the United States during the first nine months of this year were $54,096,745 and exports $46,649,387, making excess imports of $7,447,348. New York spot price in October moved between 64⅝ cents early in month and 63¾ cents at end of month.

PLATINUM

Holders quote $116 for refined platinum. Sellers do not force the market and the trade is taking normal quantities.

OLD METALS

A weak and acutely depressed market for most of the scrap metals exist. Lead is an exception, and consumers are taking considerable quantities of lead scraps. The drastic decline in new copper has unsettled the market for old material and the alloys of brass and copper. There has been some movement in heavy copper scrap for speculative account in expectation that bottom prices are not far off. Consumers are keeping down their requirements until the outlook is less uncertain. Prices which dealers are ready to pay quote 10½ to 11 cents for strictly crucible copper, 5 to 5½ cents for yellow heavy brass, 8½ to 9 cents for light copper, 6 to 6¼ cents for No. 1 brass turnings, high brass clippings 8 to 8¼ cents, heavy lead 5½ to 5⅝ cents, aluminum clippings 16½ to 17 cents, and old zinc scrap 4 to 4¼ cents.

WATERBURY AVERAGE

Lake Copper—Average for 1922, 13.844—January, 1923, 14.875—February, 15.75—March, 17.25—April, 17.125—May, 16.125—June, 15.25—July, 15.00—August, 14.50—September, 14.00—October, 13.25.

Brass Mill Zinc—Average for 1922, 6.283—January, 1923, 8—February, 8—March, 8.70—April, 8.25—May, 7.60—June, 7.00—July, 6.80—August, 7.10—September, 7.30—October, 7.10.

Daily Metal Prices for the Month of October, 1923

Record of Daily Highest, Lowest and Average

Metal Prices for November 2

	1	2	3	4	5	8	9	10	11	*12	15	16	17	18
Copper (f. o. b. Ref.) c/lb. Duty Free....														
Lake (Delivered).....	13.75	13.75	13.50	13.50	13.50	13.50	13.25	13.25	13.25	....	13.25	13.25	13.25	13.25
Electrolytic	13.35	13.20	13.10	13.20	13.25	13.15	12.95	12.85	12.85	....	12.90	12.90	12.90	12.90
Casting	13.125	13.00	12.75	12.875	13.00	12.875	12.625	12.50	12.50	....	12.50	12.50	12.50	12.50
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.														
Prime Western.....	6.30	6.30	6.30	6.30	6.30	6.30	6.25	6.25	6.20	....	6.25	6.30	6.35	6.40
Brass Special.....	6.45	6.45	6.40	6.40	6.40	6.40	6.40	6.40	6.30	....	6.35	6.40	6.45	6.50
Tin (f. o. b. N. Y.) c/lb. Duty Free.....														
Straits	42.125	41.85	41.75	42.75	42.75	42.25	42.25	41.75	41.375	....	41.60	41.50	41.75	41.875
Pig, 99%	41.50	41.25	41.125	41.875	42.00	41.75	41.75	41.25	40.875	....	41.00	40.875	41.125	41.375
Lead f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	6.70	6.70	6.70	6.70	6.70	6.65	6.65	6.65	6.60	....	6.60	6.60	6.60	6.60
Aluminum c/lb. Duty 5c/lb.....	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	....	27.00	27.00	27.00	27.00
Nickel c/lb. Duty 3c/lb.														
Ingot—Internat. Nick. Co.—	29	29	29	**29**	29	29	29	29	29	....	29	29	29	29
Outside spot.....	28	28	28	28	28	28	28	28	28	....	28	28	28	28
Electrolytic (Internat. Nick. Co.)—														
Ni. 99.80 contam. impur.—.14.....	32	32	32	32	32	32	32	32	32	....	32	32	32	32
Brit. —Amer. Nick. Corp.														
Ni.—98.50 contam. impur.—.80.....	29	29	29	29	29	29	29	29	29	....	29	29	29	29
Antimony (J. & Ch.) c/lb. Duty 2c/lb...	7.65	7.65	7.65	**7.60**	7.60	7.60	7.60	7.55	7.55	....	7.55	7.55	7.60	7.65
Silver (foreign) c/oz. Duty Free	64.50	64.50	64.125	64.00	63.875	63.50	63.625	63.875	63.50	....	63.25	63.25	63.25	63.25
Platinum $/oz. Duty Free.....	116	116	116	116	116	116	116	116	116	....	116	116	116	116

	19	22	23	24	25	26	29	30	31	High	Low	Aver.	Nov. 2
Copper (f. o. b. Ref.) c/lb. Duty Free....													
Lake (Delivered).....	13.25	13.25	13.25	**13.00**	13.00	13.00	13.00	13.00	13.00	13.75	13.00	13.273	13.00
Electrolytic	12.80	12.70	12.60	12.55	12.55	12.60	12.60	12.55	12.55	13.35	12.55	12.864	12.70
Casting	12.50	12.50	12.375	12.375	12.25	12.25	12.25	12.25	12.25	13.125	12.25	12.557	12.375
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western.....	6.40	6.35	6.30	6.30	6.35	6.40	6.35	6.35	6.35	6.40	6.20	6.316	6.35
Brass Special.....	6.50	6.45	6.45	6.40	6.45	6.50	6.45	6.45	6.45	6.50	6.30	6.427	6.45
Tin (f. o. b. N. Y.) c/lb. Duty Free.....													
Straits	41.50	41.00	41.25	41.75	42.50	42.375	41.50	41.75	41.75	42.75	41.00	41.861	41.875
Pig, 99%	41.00	40.50	40.50	41.00	41.625	41.625	41.00	41.25	41.25	42.00	40.00	41.25	41.375
Lead f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	6.60	6.60	**6.55**	**6.60**	6.60	6.50	6.45	6.45	6.45	6.70	6.45	6.602	6.45
Aluminum c/lb. Duty 5c/lb.....	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	26.50
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.—	29	29	29	29	29	29	29	29	29	29	29	29	29
Outside spot.....	28	28	28	28	28	28	28	28	28	28	28	28	28
Electrolytic (Internat. Nick. Co.)													
Brit.-Amer. Nick. Corp.	32	32	32	32	32	32	32	32	32	32	32	32	32
Ni. 99.80 contam. impur.—.14.....													
Brit.-Ameri. Nick Corp.													
Ni.—98.50 contam. impur.—.80.....	29	29	29	29	29	29	29	29	29	29	29	29	29
Antimony (J. & Ch.) c/lb. Duty 2c/lb..	7.65	7.75	8.00	8.25	8.375	8.50	8.50	8.50	8.75	8.75	7.55	7.867	9.00
Silver (foreign) c/oz. Duty Free	63.375	63.75	63.625	63.875	63.50	63.75	63.75	63.625	63.375	64.50	63.25	63.688	63.375
Platinum $/oz. Duty Free.....	116	116	116	116	116	116	116	116	116	116	116	116	120

*Holiday.

Metal Prices, November 2, 1923

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	9 to11
Brass Ingots, Red	11 to13
Bronze Ingot	12½to14
Bismuth	$2.75
Cadmium	85 to90
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$3.00
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	13 to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Magnesium Metal	$1.25–1.50
Parsons Manganese Bronze Ingots	18 to19½
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17½to21
Phosphor Tin, guaranteed 5%	50 to58
Phosphor Tin, no guarantee	48 to56
Quicksilver	$60–$61
Silicon Copper, 10%.....according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
11 to11¼	Heavy Cut Copper	12½to13
10½to10¾	Copper Wire	12 to12¼
9 to 9¼	Light Copper	10¼to10¾
9 to 9¼	Heavy Machine Comp.	10½to11
6¼to 6½	Heavy Brass	8½to 9
5 to 5½	Light Brass	6¼to 6¾
6½to 6¾	No. 1 Yellow Brass Turnings	7¼to 8¼
8¼to 8½	No. 1 Comp Turnings	9 to 9¾
5¾to 6¼	Heavy Lead	6¼to 6½
2¾to 3½	Zinc Scrap	3¾to 4¼
8¼to 8¾	Scrap Aluminum Turnings	10¾to11¼
14¼to14¾	Scrap Aluminum, cast alloyed	16¼to16¾
15¼to16¼	Scrap Aluminum, sheet (new)	17¼to18¼
22¼	No. 1 Pewter	26¼
13¼	Old Nickel anodes	15¼
21¼to23¼	Old Nickel	25¼to27¾

BRASS MATERIAL—MILL SHIPMENTS

In effect Oct. 26, 1923

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.17	$0.18¾	$0.20½
Wire	0.17½	0.19¼	0.21
Rod	0.14¾	0.19½	0.21¼
Brazed tubing	0.25	.....	0.30¼
Open seam tubing	0.25	.....	0.30¼
Angles and channels	0.28	.....	0.33¼

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18	$0.19¾	$0.21½
Wire	0.18½	0.20¼	0.22
Rod	0.15¾	0.20½	0.22¼
Brazed tubing	0.26	.....	0.31¼
Open seam tubing	0.26	.....	0.31¼
Angles and channels	0.29	.....	0.34¼

SEAMLESS TUBING

Brass, 21½c. to 22½c. per lb. base.
Copper, 23c. to 24c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19c. net base
Muntz or Yellow Metal Sheathing (14"x48")	17c. net base
Muntz or Yellow Rectangular Sheets other than Sheathing	18c. net base
Muntz or Yelloy Metal Rod	15c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	20¼c. to 21¼c.
From stock	21¼c. to 22¼c.

BARE COPPER WIRE—CARLOAD LOTS

15c. to 15½c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	19c. per lb. base
100 lbs. to 200 lbs. in one order	19½c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9¼c. basis less 8 per cent. discount.

Casks, jobbers' prices	10¾c. to 11½c.
Open casks, jobbers' prices	11½c. to 12½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	37c.
Aluminum coils, 24 ga. and heavier, base price	35c.
Foreign	36-38c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	24½c. per lb.
15% "	26c. per lb.
18% "	27¼c. per lb.

Nickel Silver Wire and Rod

10% "	27¾c. per lb.
15% "	31¼c. per lb.
18% "	34¼c. per lb.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Rot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheets—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 67c. to 69c. per Troy ounce, depending upon quantity.

Rolled sterling silver 64½c. to 66½c.

NICKEL ANODES

85 to 87% purity	31½c.-34c. per lb.
90 to 92% purity	34c.-36c. per lb.
95 to 97% purity	36c.-38c. per lb.

Supply Prices, November 2, 1923

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.24½–.27
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.45–.50
Denatured in bbls.	gal.	.51–.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech., Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green, bbls	lb.	.39¼
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	6.75
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½–.40
Salts, single bbls	lb.	.11½
Salts, double, bbl	lb.	.10½
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.09
Potassium Bichromate casks	lb.	.10¼
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.44½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.06
Cyanide, 96 to 98%, 100 lbs	lb.	.23
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.03
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass) bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.21–.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.32
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.37
Cyanide	lb.	.37
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	42.95
14 inch, 20 ply, 64/68, cloth	base,	53.40
12 inch, 20 ply, 84/92, cloth	base,	45.00
14 inch, 20 ply, 84/92, cloth	base,	60.60
12 inch, 20 ply, 88/96, cloth	base,	48.65
14 inch, 20 ply, 88/96, cloth	base,	65.50
Sewed Buffs, per lb., bleached and unbleached	base,	.65 to .75

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10″ to 16″	1″ to 3″	2.75	2.50
" 6″ 8″ and over 16″	1″ to 3″	2.85	2.60
" 6″ to 24″	Over 3″	3.15	2.80
" 6″ to 24″	½″ to 1″	3.75	3.50
" 4″ to 6″	¼″ to 3″	4.75	Any quantity
" Under 4″	¼″ to 3″	5.35	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.